SCIENTIFIC AMERICAN

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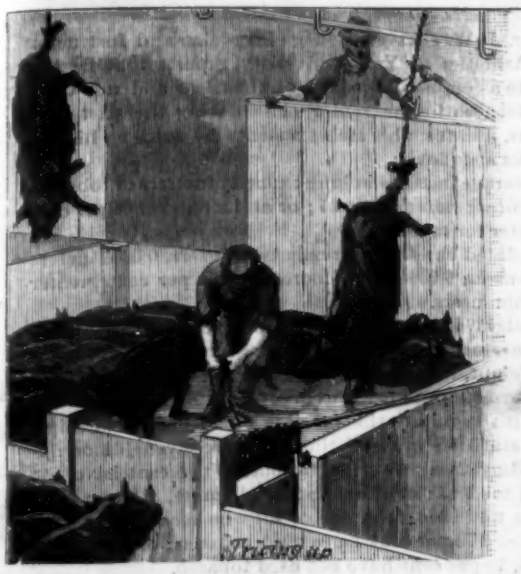

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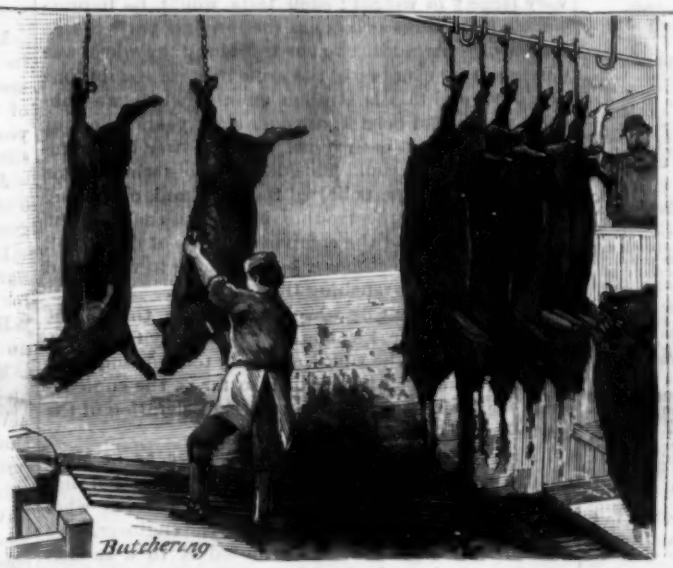

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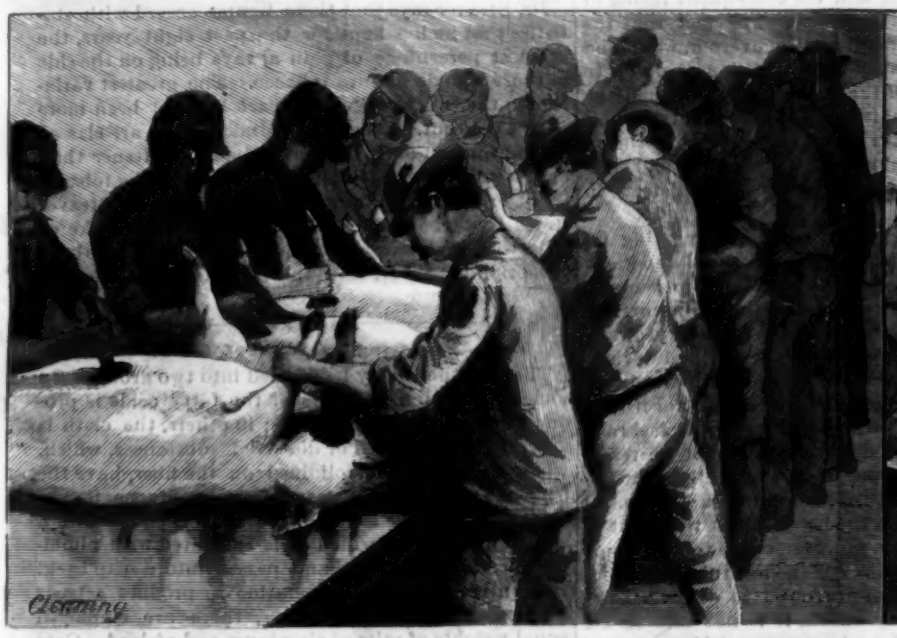

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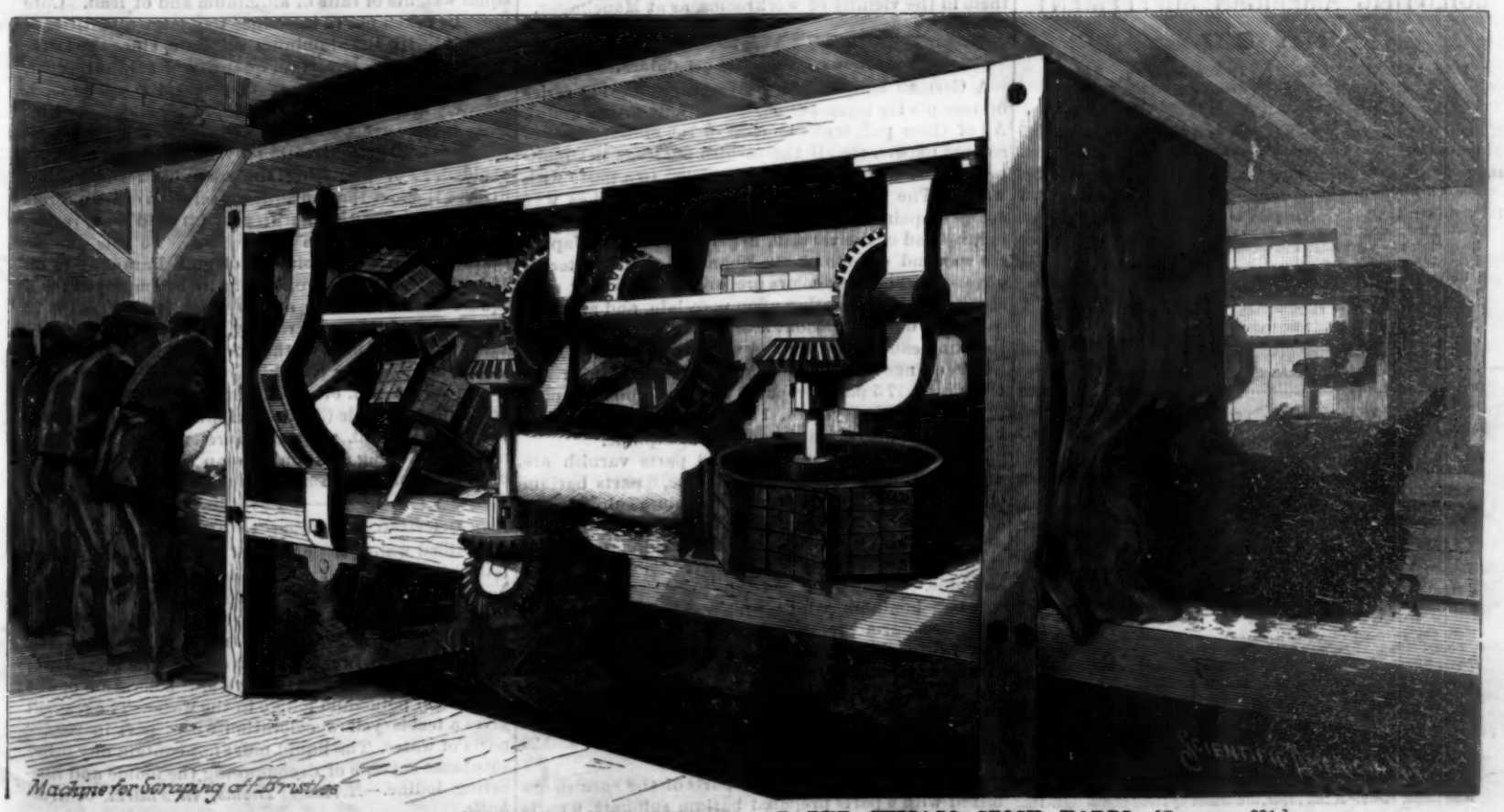

Machine for Scraping off Bristles

THE AMERICAN PORK INDUSTRY—HOG KILLING AT THE CHICAGO STOCK YARDS.—[See page 291.]

Scientific American.

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NEW YORK, SATURDAY, NOVEMBER 7, 1891.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 827.

For the Week Ending November 7, 1891.

Price 10 cents. For sale by all newsdealers

DANGERS OF LARGE FLY WHEELS.

The bursting of the 68 ton fly wheel of the great engine in the Amoskeag mills, Manchester, N. H., furnishes additional evidence, if such were needed, to prove that with the means now at hand the possibility of flaws in large castings cannot be determined with certainty. In his testimony before the coroner's jury, the superintendent of the mill said: "The remnants of the fly wheel show very many internal flaws where the iron is drawn badly by shrinkage in cooling, all of which it was impossible to discover without destroying the wheel; sounding would not show the flaws. If you join two cubes of iron of equal size, one solid, the other filled with these shrinkage flaws, the parts would vary largely in weight; such tests would be impracticable in castings as large as the integral parts of this fly wheel." According to the testimony the wheel was moving at its usual rate, the same being 61 revolutions a minute, and this is strange enough when we consider that it had been in use over eight years for about three months of each year, water power being employed in the interim. This, like all big wheels, was composed of segments bolted together, and, of course, it is possible that the trouble began on the rim, the bolts loosening and the component parts of the wheel, or those of imperfect make, being unable to withstand the shock of the wrenching that followed.

In another recent fly wheel catastrophe, that in the power house of the Electric Street Railway Company, of Cincinnati, O., the wheel, a twenty ton one, suddenly flew apart and at a time when, so far as the engineer could see, there was not any undue acceleration of the engine's movements.

In this case there were no casualties, as at Manchester, and hence no inquest. The investigation that followed was conducted by interested persons who, notwithstanding the declaration of the engineer, who was present at the time, attributed it to a sudden withdrawal of the load and the consequent racing or "running away" of the engine. The fact that the automatic cut-off, operated by the governor, was found to be intact might fairly be accepted as helping to sustain the assertion of the engineer, because, had the engine been relieved of its load, this automatic cut-off would undoubtedly have held the engine to within a few turns of its normal speed. It would seem, therefore, as if this, too, might be a case of defects in casting.

A recent inquiry among the makers of these big fly wheels failed to discover one among them who knew of any test for large castings by which the presence of flaws, the result of air bubbles in moulding or improper cooling, could be discovered. About a year ago there was a report that a French inventor had devised a means of doing this by electricity, the apparatus being called a "schiseophone." It was said for it that it would indicate the presence of flaws in steel rails that the ordinary hammer test could not be relied upon to discover, or, to put it more correctly, that the human ear is not sensitive enough to read the warning that may be given in the hammer test when put to large castings. Nothing, however, seems to have come as yet of all the promises made for this invention. Till such or similar means are found to discover flaws in segments for large fly wheels, it is not safe to use them in the vicinity of workrooms, as at Manchester.

Luminous Paints in all Colors.

A German contemporary gives the following series of receipts for these paints, which may prove useful. All of these paints can be used in the manufacture of colored papers, etc., if the varnish is altogether omitted, and the dry mixtures are ground to a paste with water. The luminous paints can also be used as wax colors for painting on glass and similar objects, by adding, instead of the varnish, 10 per cent more of Japanese wax and one-fourth the quantity of the latter of olive oil. The wax colors prepared in this way may also be used for painting upon porcelain, and are then carefully burned without access of air. Paintings of this kind can also be treated with water glass.

For orange luminous paint, 46 parts varnish are mixed with 17·5 parts prepared barium sulphate, 1 part prepared Indian yellow, 1·5 parts prepared madder lake, and 38 parts luminous calcium sulphide.

For yellow luminous paint, 48 parts varnish are mixed with 10 parts barium sulphate, 8 parts barium chromate, and 34 parts luminous calcium sulphide.

For green luminous paint, 48 parts varnish are mixed with 10 parts prepared barium sulphate, 8 parts chromium oxide green, and 34 parts luminous calcium sulphide.

A blue luminous paint is prepared from 42 parts varnish, 10·2 parts prepared barium sulphate, 6·4 parts ultramarine blue, 5·4 parts cobalt blue, and 46 parts luminous calcium sulphide.

A violet luminous paint is made from 42 parts varnish, 10·2 parts prepared barium sulphate, 2·8 parts ultramarine violet, 9 parts cobaltous arsenate, and 36 parts luminous calcium sulphide.

For gray luminous paint, 45 parts of the varnish are mixed with 6 parts prepared barium sulphate, 6 parts prepared calcium carbonate, 0·5 part ultramarine blue, 6·5 parts gray zinc sulphide.

A yellowish-brown luminous paint is obtained from 48 parts varnish, 10 parts precipitated barium sulphate, 8 parts auripigment, and 34 parts luminous calcium sulphide.

Luminous colors for artists' use are prepared by using pure East India poppy oil, in the same quantity, instead of the varnish, and taking particular pains to grind the materials as fine as possible.

For luminous oil-color paints, equal quantities of pure linseed oil are used in place of the varnish. The linseed oil must be cold-pressed and thickened by heat.

Tobacco and Physical Health.

Dr. J. W. Steaver, College Physician and Instructor in Athletics at Yale University, reports that he has made a comparative study of the users and non-users of tobacco in the senior class during the past four years, and from his measurements he sums up his statistics as follows:

Average increase in lung capacity in *users* of tobacco, 0·15 liter; *non-users*, 0·25; or an increase of 66 per cent greater for non-users.

Inflated chest measurements, in *users*, 0·0304 meter; *non-users*, 0·0364, or an increase of 19 per cent greater for non-users.

Height, in *users*, 0·0169 meter; *non-users*, 0·0202, or an increase of 20 per cent greater in non-users.

Weight, in *users*, 0·4 kilogramme; *non-users*, 0·5, or an increase of 25 per cent greater for non-users.

With regard to the possible effect on scholarships, the statistics are: Of those who received junior appointments above dissertations, 95 per cent have not used tobacco; of those above colloquies, 87½ per cent have not used tobacco; of all who received appointments, 84·3 per cent have used tobacco; of the entire class, 70 per cent have not used tobacco.

Dr. Steaver says that these figures accord with statistics that he has kept for the past eight years, the greatest percentage of gain always being on the side of those who do not use tobacco. The greatest variation in the two years' widest part has not been more than 4 per cent. Some of the students who are classed among the non-users do smoke, but not oftener than once a week, or at such long intervals that the tobacco is apt to have little or no effect on them. Dr. Steaver states that the prominent athletes do not smoke or otherwise use tobacco as a rule, Calhoun being the only exception in college. All the candidates for the crew abstain from tobacco.

Preparing Waterproof Cloth.

These methods may be divided into two groups. In some, a precipitate of salts of the fatty acids is produced upon the tissue itself; in others, the cloth is saturated with melted or dissolved substances, which, when they are once solidified on the fiber, have the property of repelling water. If any of the former class of methods is selected, the cloth is passed into a special machine, in which it is saturated with aluminum acetate; it is dried and passed into a soap beck. It is necessary in this operation to produce a basic compound. For this purpose, there are employed equal weights of salts of aluminum and of lead. Care must be taken not to introduce too large quantities of free acid with the aluminum sulphate, since the latter contains always a certain quantity of sulphuric acid, which, during desiccation, displaces the acetic acid. To avoid this inconvenience, there are added per liter from 10 to 80 grms. of soda. The most favorable temperature is 50 deg. Heating by direct steam must be avoided. For preparing the soap bath the author utilizes the fact that an aqueous solution of soap forms true solutions with mixtures of fat and wax, resins, mineral oils, and even caoutchouc. To this end he takes a ten per cent solution of gum Paraguay in oil of turpentine. The proportions to be employed for a square meter of cloth are 30 grms. tallow soap, 25 Japan wax, 1·5 gum Paraguay, 1 grm. good varnish. The wax is first melted, the gum and the varnish are added, and then for each kilo. of the solid gum there are added 0·5 grm. of a solution, saturated in heat, of potassium sulphide (liver of sulphur). The mixture is stirred and boiled, when sulphureted hydrogen is liberated. A boiling solution of soap is added, when the bath is fit for use.—*Em. Doring, in Romen's Journal.*

Detection of Copper in Distilled Water.

Distilled water, the purity of which has been ascertained by the ordinary methods, becomes colored yellow on dissolving in it potassium iodide. A closer examination admits of the detection of infinitesimal quantities of copper, which neither ammonia nor potassium ferrocyanide had revealed. The presence of this impurity occasions the yellow coloration of the solution of potassium iodide in the water. The reagent gives a feeble yellow coloration with 1 part in 200,000 parts of water. The liquid must not contain any other substance capable of decomposing the iodide and liberating iodine.—*Herman Thoms, in Pharm. Centralhalle.*

Pushing the Work for the World's Fair.

From a recently issued report of the Department of Publicity and Promotion of the Columbian Exposition to be held in Chicago in 1893, it is apparent that a much greater amount of work has been already done than is generally known. It is stated that all of the great buildings have been contracted for and are under construction, and on several of them work is proceeding night and day, all being pushed to completion by large forces of workmen. Insurance is placed and increased on the buildings as their construction proceeds. It is the intention to carry insurance aggregating $300,000,000 on the buildings and exhibits. The following statement of the exposition's finances is made by the report: Resources—Stock subscriptions, $5,608,110; city of Chicago bonds, $5,000,000; prospective gate receipts, $10,000,000; concessions and privilges, $1,500,000; salvage, $1,000,000; interest on deposits, $270,035; total, $23,135,145. Of the subscriptions already received, 60 per cent has been called for, and considerably more than $3,000,000 has been paid in. The number of subscribers is over 30,000. The $5,000,000 in city bonds is certain to be realized in full, as Chicago's credit is excellent. The gate receipts, concessions and privileges, and salvage are necessarily prospective, and the amounts given are of course estimates. It is believed they are moderate.

The amounts thus far appropriated by the States and Territories to secure their proper representation at the fair are as here shown:

Arizona	$30,000	New Hampshire	$35,000
California	300,000	New Jersey	20,000
Colorado	100,000	New Mexico	25,000
Delaware	10,000	North Carolina	25,000
Idaho	20,000	North Dakota	25,000
Illinois	800,000	Ohio	100,000
Indiana	75,000	Pennsylvania	300,000
Iowa	50,000	Rhode Island	25,000
Maine	40,000	Vermont	15,000
Massachusetts	75,000	Washington	100,000
Michigan	100,000	West Virginia	40,000
Minnesota	50 000	Wisconsin	65,000
Missouri	150,000	Wyoming	30,000
Montana	50,000	Total	$2,695,000
Nebraska	50,000		

The following States have appropriations pending in their legislatures. The sums they are endeavoring to raise are:

Alabama	$100,000	Oregon	$100,000
Arkansas	100,000	South Dakota	80,000
Florida	100,000	Tennessee	50,000
Georgia	100,000	Texas	200,000
Kansas	100,000		
Total			$1,030,000

The foreign nations and colonies that have so far determined to participate in the exposition, and the amounts they purpose to expend, are the following:

Argentine Rep	$100,000	British Guiana	$15,000
Austria-Hungary	168,000	British Honduras	7,000
Bolivia	150,000	Cape Colony	10,000
Brazil	445,000	Trinidad	10,000
Chili	100,000	Guatemala	120,000
Colombia	100,000	Honduras	20,000
Costa Rica	50,000	Japan	500,000
Danish W. Indies	10,000	Mexico	750,000
Ecuador	125,000	Nicaragua	20,000
France	400,000	Peru	100,000
Germany	250,000	Salvador	30,000
Great Britain	125,000	Cuba	25,000

This partial list foots up thirty-one nations and fourteen colonies, and appropriations aggregating $3,630,000. The United States government has appropriated thus far $1,500,000, of which $400,000 is available for its building alone.

RULES FOR EXHIBITORS.

L. W. Robinson, chief of the department of machinery, has formulated the rules. They have not been officially approved by the Director-General, but with a few minor modifications they will probably stand as follows:

A limited quantity of steam and water power will be furnished for the purpose of exhibiting machinery in operation, the quantity of each to be definitely settled at the time of allotment of space. Any excess will be charged for at a fixed price. Demands for such excess must also be settled at time of allotment of space.

Exhibitors will not be allowed to exhibit any kind or class of goods except those specified in the application.

Exhibitors must be manufacturers of machinery and not dealers only.

Exhibitors must provide showcases, shelvings, counters, fittings, countershafts, pulleys, beltings, etc., at their own expense.

Exhibitors are required to furnish the following information and a drawing to the scale of one-fourth inch to the foot of the plans and distribution of the objects they wish to exhibit. If machinery, actual horse power required. Cubic feet of steam used per hour at a pressure of 150 pounds. Diameter of steam and water pipes. Diameter of discharge drain pipes. The main shafts will make 120 and 240 revolutions per minute. Dimensions of space required must be given in feet and inches, without including any allowance for passageways. What per cent of labor performed by females in the production of articles exhibited. Whether the applicant is a producer or manufacturer.

By special arrangements the installation of heavy articles requiring foundation should begin while the building is under construction.

The floor of Machinery Hall will support 250 pounds per square foot. The heaviest single piece received must not weigh more than 30,000 pounds, as facilities will not be provided for handling heavier weights.

The steam pressure supplied will be 150 pounds to the square inch. Those wishing to secure lower pressure may do so by using a reducing valve.

Water pressure will be that due to a head of 225 feet, or a pressure of 98 pounds to the square inch and a head of 40 feet, or a pressure of 175 pounds to the square inch.

The line shafting will be 16 feet from the center of the shaft to the floor.

Driving pulleys are limited to thirty-six inches in diameter.

Exhibitors of steam and other machinery who desire to offer the exhibits for use by the Exposition Company should send their applications as soon as possible.

Such exhibitors may select their own men to operate this machinery. Their wages will be fixed and paid by the Exposition Company.

The Exposition Company will defray the necessary expenses of exhibitors, loaning them machines, tools, etc., for use beyond that which they would have incurred as exhibitors simply, wear and tear excepted.

Platforms, counters, ornamental partitions, show cases, etc., will be at the expense of the exhibitors and must not exceed these dimensions: Show cases, fifteen feet above the floor; counters, two feet ten inches; platforms, one foot; partitions, fifteen feet.

All exhibits of machinery in motion must be inclosed by a railing two feet and six inches in height to come inside the space. No signs will be allowed to extend over the passageway and no signs will be allowed made of muslin, linen, canvas or paper.

No fire will be allowed in Machinery Hall except by special permission. Not more than a day's supply of oils or other inflammable substances will be permitted in Machinery Hall, but a suitable place for the storage of these materials will be provided.

No steam or water pipes will be permitted to extend over the passageways except when specially provided.

Exhibitors not desiring to employ attendants or watchmen may leave their exhibits in the care of the department, which will assume the responsibility of their cleanliness.

Toning Ferro-Prussiate Prints.

The intense blue color of the ordinary blue print gives unnatural effects in prints from photographic negatives, also in architectural drawings where views and elevations of buildings are reproduced. The following method of toning such blue prints has been found to be easy of application, and to give tones varying from a brilliant blue through violet blue to neutral tint and warm shades of gray, according to the intensity of the action of the bath. The paper employed may be common blue print paper, sold ready for use in rolls, or the specially made paper sold in packages of cut sheets by the dealers in photographic supplies. The solar printing is carried out in the usual manner. The best results are obtained with dark prints, as the intensity of the color is somewhat reduced by the toning process. The following baths are employed:

BATH A.

Muriatic (hydrochloric) acid	3 to 4 drops.
Water	16 oz. (1 pint).

BATH B.

Aqua ammonia	5 to 10 drops.
Water	16 oz. (1 pint).

BATH C.

	Apoth. weight.
Alum	2 oz.
Tannic acid	1 drachm.
Water	16 oz. (1 pint).

The prints are immersed face downward in bath A until all the soluble salts contained in the paper are dissolved and removed, then dipped into bath B until the negative turns a violet blue and the whites are clear, care being taken that the immersion in the ammonia be not continued too long, as the definition of the picture may be injured. The prints are transferred from the ammonia bath, placed face upward in a tray filled with bath C, and exposed to bright sunshine for from five to ten minutes, until no increase in the strength of the picture can be noticed. The pictures are finished by toning in bath B until the desired shade of color is obtained, the picture becoming first a brilliant blue, then violet, and finally, by prolonged action, bluish gray or neutral tint. The toning may be varied by a second immersion in the tannic acid bath C, followed by a second toning in bath B. After toning the prints are dried in the sunlight in the usual manner. The above process is specially applicable to prints from photographic negatives, enabling the amateur in the field, provided with a printing frame, some sheets of prepared blue print paper, and the above easily procured chemicals, to test the printing quality of his negatives, with results only slightly inferior in detail and definition to those obtained by the complicated process of silver printing.

Disinfection.

According to Behring, lime has about the same germicide value as the other caustic alkalies, and destroys the cholera spirillum and the bacillus of typhoid fever, of diphtheria, and of glanders, after several hours' exposure, in the proportion of 50 c.c. *normal-bauge* per liter. Wood ashes of lye of the same alkaline strength may therefore be substituted for quick lime.

It must not be forgotten that we have a ready means of disinfecting excreta in the sick room, or its vicinity, by the application of heat. Exact experiments made by the writer and others show that the thermal death point of the following pathogenic bacteria and of the kinds of virus mentioned is below 60° C. (140° F.): Spirillum of cholera, bacillus of anthrax, bacillus of typhoid fever, bacillus of diphtheria, bacillus of glanders, diplococcus of pneumonia (M. Pasteuri), streptococcus of erysipelas, staphylococci of pus, micrococcus of gonorrhea, vaccine virus, sheep pox virus, hydrophobia virus. Ten minutes' exposure to the temperature mentioned may be relied upon for the disinfection of material containing any of these pathogenic organisms—except the anthrax bacillus when in the stage of spore formation. The use, therefore, of boiling water in the proportion of three or four parts to one part of the material to be disinfected may be safely recommended for such material. Or, better still, a 10 per cent solution of sulphate of iron or of chloride of zinc, at the boiling point, may be used in the same way (three parts to one). This will have a higher boiling point than water, and will serve at the same time as a deodorant. During an epidemic of cholera or typhoid fever such a solution might be kept boiling in a proper receptacle in the vicinity of the hospital wards containing patients, and would serve to conveniently, promptly, and cheaply disinfect all excreta.—*Jour. Amer. Med. Asso.*

The Measurement of Velocities of Projectiles.*

[BY CAPTAIN H. CAPEL L. HOLDEN, R.A.

The author stated that as gunpowder making and gunnery had developed into branches of science, more accurate methods of obtaining the characteristic qualities of the explosive were required. The instruments used for determining the velocity of a projectile may be divided into two classes: 1. Those used for determining its velocity in the bore of the gun; 2, those used for measuring its velocity outside the bore. All chronographs comprise two principal organs, one for measuring time, and the other for recording the motion of the projectile. Clocks, pendulums, and tuning forks have been employed for the former, while electrical devices have been universally adopted for the latter, except in the oldest instruments. For recording the motion of the projectile by electrical means some sort of interruption in the circuit is used. When the movement in the bore has to be registered, a continuous wire is placed in the gun, the current through which is temporarily interrupted by the passage of the shot, this interruption furnishing the means of record. To obtain the record after the projectile has left the gun, upright frames placed in the path of the projectile have wires stretched over them in such a manner that, on the projectile passing through the frame, the wire carrying the current is broken. After briefly describing the principal chronographs which have been used, Captain Holden described in some detail those now employed at the proof butts of the Inspection Department of the Director of Artillery.

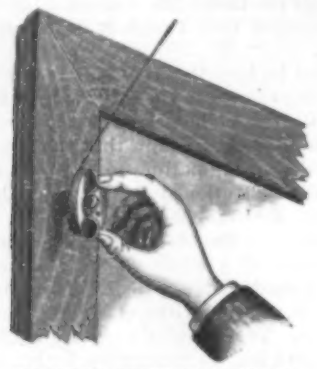
At the time the early Boulenge instruments were introduced, the highest muzzle velocity was about 1,000 ft. per second; now the velocities are nearly double this amount, and will probably reach 3,000 ft. per second. As an example, to show the degree of accuracy to which time has to be measured in order to obtain the velocity of a projectile to a foot per second, the following was given: With a shot whose mean velocity between two screens placed 180 ft. apart is 1,800 ft. per second, a variation of 1 ft. above or below 1,800 ft. per second is represented by a decrease or increase in time of only 0·0005 of a second approximately. Such accuracy can only be obtained by a careful elimination of the sources of error in the instrument used. The muzzle velocity is obtained from the recorded velocity by means of Bashford's tables, a factor being employed which varies with the form of head of the projectile.

RECENTLY at the Occidental Mill one-half of a log was sawed, which was 10 feet 3 inches in diameter. It was worked up into 3,900 feet of lumber. While this is not a remarkable thing in redwood logs, still a whole log that yields 7,800 feet of lumber is deserving of honorable mention.—*Eureka (Cal.) Standard.*

* Abstract of a paper read before the Iron and Steel Institute.

AN ADJUSTABLE PICTURE HANGER.

The device shown in the illustration can be readily attached to any picture frame, and renders the task of hanging and adjusting pictures to the proper height a comparatively easy one. The hanger is permanently attached to the frame by a screw, and the adjustment for height of picture is then effected by simply turning the hanger to the right or left, the picture wire being attached to the hanger, and being wound up or unwound as desired. To hang heavy pictures, where a separate wire is required on each side, two of these hangers are preferably used, and the leveling of the



BILLINGS' PICTURE HANGER.

picture is then easily effected. This improved hanger is manufactured by H. E. Billings, of Hartford, Conn.

Varnishing Oil Paintings.

The chief use of varnish when applied to oil paintings is to preserve and bring out the full value of the colors used, and to produce a uniform surface. Unvarnished, the picture appears dead in one part and glossy in another. It is a mistake to apply a thick coating of varnish to a painting, as all varnish oxidizes and darkens in color with age, consequently the thicker the coat of varnish the sooner it becomes discolored, and in such cases some of the most delicate of the tints are obscured. Therefore it is best to use the varnish thin, for while it protects the work from dirt and foul air, it also fulfills all the other conditions required. Of course, the above remarks apply equally to the finer examples of decorative work. For oil paintings mastic varnish is universally used, a drop or two of refined linseed oil added to the varnish prevents it cracking; it admits of being used then without reducing its body. The reason why varnish cracks, as it often does, is a debatable question among experts. Apart from the question of good or badly made varnish, there are several causes which produce the same effect. The fact is that both pictures and decorative work are varnished before the paint underneath has had time to become hard; the result being that the varnish being of a highly elastic nature contracts, as it dries, and the paint not being sufficiently hardened gives way, and at once a crack-making process begins, which can only end in the work becoming one mass of cracks. Oil paintings and decorative panel work crack because the getting up of the ground work, whether on canvas or panel, has been improperly done; from this cause alone a large percentage of otherwise good work is ruined. The result is the same in many cases whether the work has been got up in quick color or in distemper.

The Constitution of the Royal Ordnance Factories at Woolwich.

The autumn meeting of the Iron and Steel Institute was opened on the 6th of October, at the Literary Institute of the Royal Arsenal, Woolwich.

The first paper read was by Dr. W. Anderson, Director-General of Ordnance Factories. He stated that the Royal Ordnance Factories were founded upon the principle that means should be provided for the production of every kind of warlike material in a limited degree, and without discouraging the same manufactures by private establishments. The usefulness of the Royal Factories lies mainly in the facilities they offer for testing the value of warlike appliances, for the repairs of service stores, and for the prevention of "rings" among the few firms who manufacture war material. In addition, the special experience of the managers and foremen, and the abundant means available, have enabled the Ordnance Factories to supply stores which private firms are unable to produce in reasonable time.

The Royal Ordnance Factories are six in number. Three of these are situated at the Arsenal at Woolwich. Common to all the factories is the Department of Building Works, which at Woolwich has charge of twenty miles of railway, forty locomotives, and corresponding rolling stock, the hydraulic establishment, the electric light installation, the gas manufacture, the telegraph and telephone lines, etc. The Ordnance Factories differ from private factories. There is no floating capital beyond some £400,000 invested in stores; consequently, the customers for whom the work is done have to provide the money when they give the orders. The higher appointments are governed by the War Office rules. After describing the method of correspondence, the form of orders, and the preparation of estimates, the author stated that the capital account stood at £557,945 for buildings and £718,949 for machinery. The larger part of the work is done by the piece, but sub-letting is not permitted. The wages of the workpeople are in accord with outside trade prices. No special charge is made for machines and tools. The stores are kept with a care and accuracy not found in private establishments. The number of hands employed in the Ordnance Factories is 17,000, of which 13,000 are at Woolwich. Women are not employed. The average wages earned is 32s. ($8) per week per employe. In the financial year 1889–1890, the amount of completed work issued amounted to £2,359,126, the expenditure on all services was £2,590,053, of which wages were £1,339,045, and materials £1,055,224.

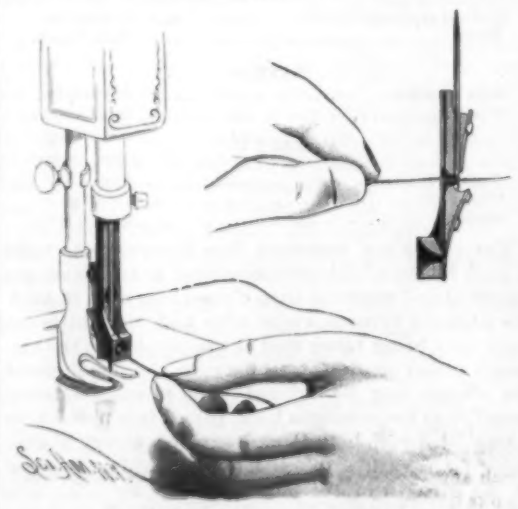
Dr. Anderson, in describing the official method of binding the correspondence on any one subject together by the "much derided red tape," caused some amusement by exhibiting samples of the official correspondence paper, red tape, and wrappers. A green wrapper in connection with a bundle of correspondence indicated that the subject matter was of urgent importance, and should be immediately dealt with.

A NEW ELECTRIC LIGHT SUPPORT.

This device is especially designed for use around work benches and in machine shops, etc., rendering the light adjustable to any desired position. The extensible lamp-supporting arm is hung by a ball and socket joint from the ceiling, there being a set-screw for regulating the friction on the ball at the upper end of the first rod, to which is adjustably attached a rod upon which the lamp-supporting and current-conducting wire is secured. The adjustable rod has its bearings in screw eyes set in the sides of the upper rod, and is pressed against the bearings by an adjustable spring. This device is equally well adapted for use on wall brackets. It is manufactured by Messrs. R. Hollings & Co., of No. 545 Washington Street, Boston, Mass.

A MACHINE AND HAND NEEDLE THREADER.

The device shown in the illustration is extremely simple and inexpensive, and can be readily attached to any sewing machine needle in place in the needle bar, as shown in one of the views, to facilitate threading the needle. It is also adapted for use in threading a hand needle, as shown in the other figure. The device is made of the proper size to allow it to be attached to the needle just below the needle bar, and is adapted for use on any style of machine. A groove extends down the front of the body, on the lower end of which is a thickened transverse portion having a funnel-shaped opening at its front opposite the eye of the needle when the threader is placed in position. The funnel opening has a slit in its upper side to permit of the removal of the thread, and a flat spring attached to an inclined back portion of the threader holds it in place on the needle. In the hand threader, the groove to receive the needle is in the back of the body, the



SLENSBY'S NEEDLE THREADER.

needle being held in place before the thread opening by a flat spring, as in the case of the machine needle, while the base of the groove is made with an inclined portion which permits of the ready adjustment of fine or coarse needles before the needle opening.

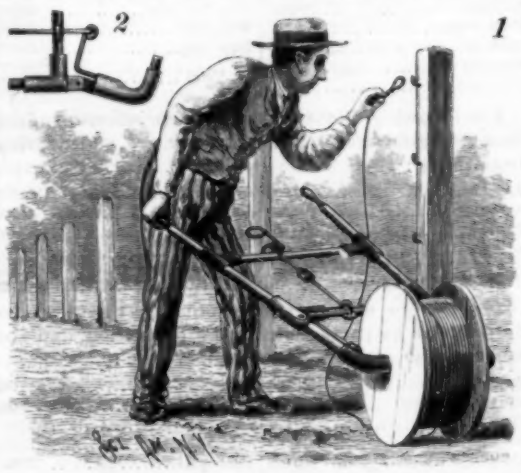
Further particulars relative to this invention may be obtained of Mr. W. P. Slensby, No. 7 Warren Street, N. Y. City.

The Basking Shark.

The "basking shark" (*Selache maxima*, L.) is apparently no very uncommon visitor in New Zealand waters. In the new volume of the Transactions and Proceedings of the New Zealand Institute, Mr. T. F. Cheeseman, Curator of the Auckland Museum, describes a specimen, over thirty-four feet long, which was stranded near the mouth of the Wade River. Mr. R. H. Shakspere, of Whangaparaoa, who saw the specimen very shortly after it was stranded, has informed Mr. Cheeseman that every spring several individuals of the same species can be seen near the entrance of the Wade River, and along the shores of Whangaparaoa Peninsula. He believes that they visit these localities in search of their food, which he thinks is composed of small *Medusæ* and other pelagic organisms. They can be easily recognized from their habit of swimming on the surface of the water, a portion of the back and the huge dorsal fin being usually exposed. It is from this circumstance, taken with the fact that their motions are very slow and sluggish, that they have received the name of the "basking shark." They are easily approached and harpooned, and on the west coast of Ireland as many as five hundred have been taken in a single season. The liver often weighs as much as two tons, yielding six to eight barrels of oil.

A TRUNDLER FOR SPOOLED WIRE.

The illustration shows a strong, light, and convenient device for distributing fence and telegraph wire, etc., coiled on flanged spools, along the lines where fences are to be made or electric conductors are to be put up. It has been patented by Mr. Cullen R. Smith, of Prairie Lea, Tex. The frame of the device has at its forward end curved L's, one of which has a hinged connection to the side bar, as fully shown in Fig. 2, these L's terminating in aligning pintles adapted to be axially inserted in perforations in the sides of the spool



SMITH'S TRUNDLER FOR SPOOLED WIRE.

drum. Attached to the hinged L is a bent arm connected by a loop or eye with a pusher rod sliding in staples on cross bars of the frame, the opposite end of the rod being bent to form a locking shoulder and handle, while its central portion is intersected by a turnbuckle. By pushing this rod forward one of the pintles is swung outward, as shown in Fig. 2, to permit of attaching the device to a spool, when the rod is drawn back and its shoulder engaged with one leg of the staple, whereby the device is held in locked position upon the spool. To bring tension upon the wire as laid, the turnbuckle is turned to shorten the pusher rod, the shoulders on the pintles thus being pressed inward to cause friction on the spool ends. The device may also be utilized to transfer wire rolls from one point to another, and also for rolling barrels or casks, the ends of the pintles, in the latter case, being slightly pointed, to engage the opposite heads of the vessels.

To Color Iron and Steel a Dead Black.

A new blacking fluid has been invented by M. Mazure. According to *Cosmos*, this liquid has the following formula:

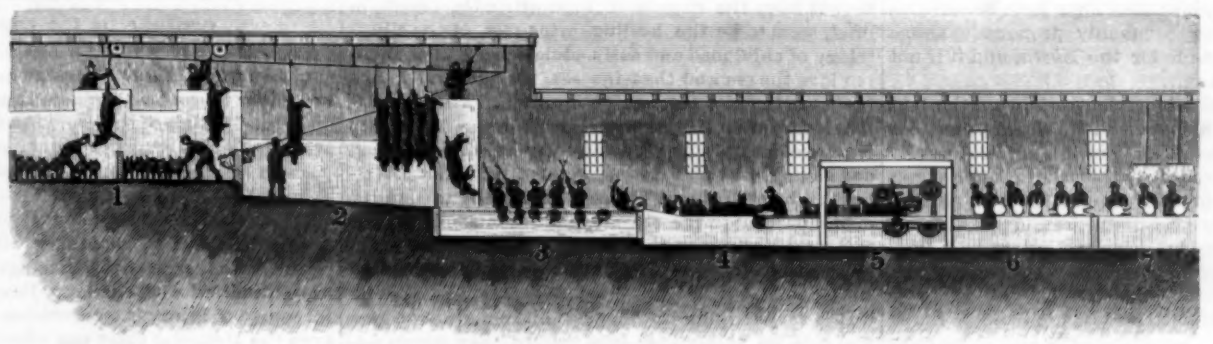
Bismuth chloride	1 part.
Mercury bichloride	2 "
Copper chloride	1 "
Hydrochloric acid	6 "
Alcohol	5 "
Water	50 "

Mix. To use this fluid successfully, the article to be blacked or bronzed must be clean and free from grease. It may be applied with a brush or swab, or, better still, the object may be dipped into it. Let the liquid dry on the metal, and then place the latter into boiling water, and maintain the temperature for half an hour. If the color is then not as dark as desired, repeat the operation. The editor of the *National Druggist* finds it to work beautifully. After getting the desired color, the latter is fixed and much improved by placing for a few minutes in a bath of boiling oil, or by coating the surface with oil and heating the object until the oil is driven off.

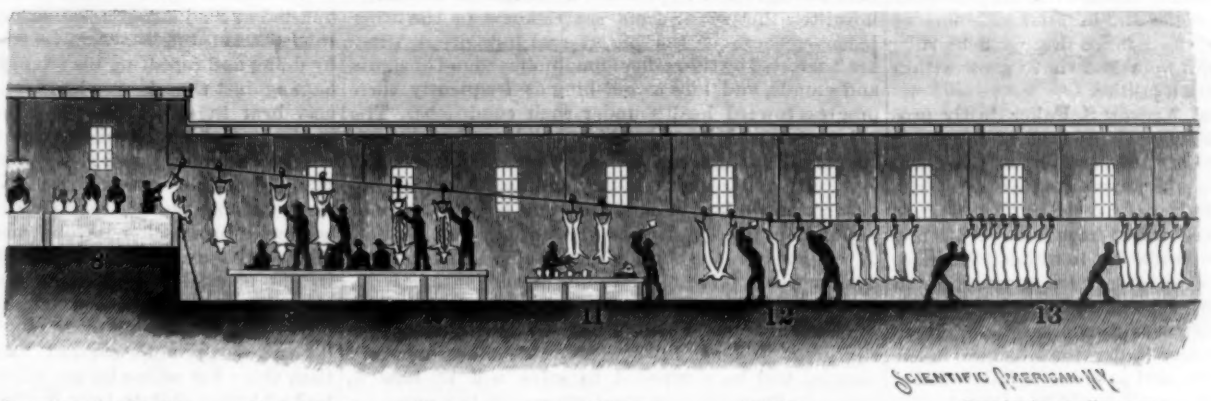
HOG KILLING AT THE CHICAGO STOCK YARDS.

According to the United States Department of Agriculture, there were, on Jan. 1, 1891, over fifty millions of swine in the United States, more than three-fifths of which were in twelve so-called packing States, four of these States, Iowa, Illinois, Missouri, and Kansas, having together 18,596,000, or nearly two-fifths of the total for the whole country. The city of Cincinnati was for many years familiary designated as Porkopolis, as the leading center of the pork-packing business, but Chicago long ago passed the Queen City in this specialty, almost at the same time that it attained so striking a prominence in the business of beef packing. There is probably no more interesting subject to the economist and statistician, at the present time, than that presented by an investigation of the vast business carried on at the Chicago stock yards, and it is not surprising, therefore, that visitors to Chicago are always expected to make the tour of the stock yards before they can be said to have a proper appreciation of the enterprise and business ability which have made the city what it is.

In the accompanying illustrations we have endeavored to make our readers participants in the advantages of such a visit, so far as our artist has been able to represent one of the most important branches of business carried on at the stock yards, the pictures showing details of the pork-packing industry, as carried on by the house of Armour & Co., who have long stood at the head of the trade as being the largest packers and shippers. Their trade extends to all parts of the globe, and the number of hogs killed by them for the year ending April 1 last numbered 1,714,000, besides 712,000 cattle and 413,000 sheep. They have 7,900 employes, and 2,250 cars are equipped with refrigerating apparatus for the transportation of their products. The ground area covered by the buildings is 50 acres in extent, giving a floor area of 140 acres, a chill room and cold storage area of 40 acres, and a storage capacity of 130,000 tons. In addition the firm has separate glue works, with buildings covering 15 acres, where 600 hands are employed, their production last year having been 7,000,000 pounds of glue and 9,500 tons of fertilizers.



Tricing up. Butchering. Scalding. Attaching to cable. Scraping. Cleaning. Washing.



Inspection—throat cutting, hanging on trolly. Cutting open and entrail stripping. Taking out leaf lard. Heads off, tongues out. Splitting. Running into cooling room.

THE CHICAGO STOCK YARDS—SUCCESSIVE OPERATIONS FROM CATCHING PEN TO COOLING ROOM.

The hogs, as they arrive by train from all sections, are kept in the extensive yards and sheds adjacent to the buildings until they are wanted for slaughtering, which may be a few days or but a few hours. While they remain here, however, they are always well fed and watered, and they are selected for killing according to the various markets, their ages generally being from six to eighteen months, and the average weight being from 150 to 200 pounds.

Each lot of animals, as they are taken from the pens, is duly weighed on standard scales, after which they are driven over what is styled the "Bridge of Sighs" into an upper story of the building where the work commences, about a score being inclosed together in a catching pen. Then to one hind leg is attached a short piece of chain, having a ring at its opposite end, and into this ring the operator passes a hook on the end of a chain lowered from a roller overhead, the latter chain being steadily wound up by power. As the head of the animal is raised, another hook, suspended from a wheel, is fixed into the ring, and this wheel runs on a rail onward through several large rooms, always at an incline, down which the animal is carried by his own gravity. As he is swung over the wall of the catching pen, the butcher, with one thrust of a sharp, short knife, always reaches to the heart, insuring almost instant death, there being no squealing and but very little muscular twitching after the thrust. The blood flows through an inclined grating into a receptacle below, and of itself is an article of considerable value, utilized for several important purposes.

Passing on beyond the butcher, the animals are unhooked and plunged into a vat of steam-heated water, where nine or ten are immersed together, and where they are kept for about three minutes, that the hair may be readily scraped off. From the farther end of the vat, every few seconds, a curved, rake-like gridiron, attached to a cable, lifts a steaming hog out on a table, along which passes an endless chain, to which the hog, hooked by the nose, is attached, to be drawn through a scraping machine, as shown in the lower picture in our first page illustrations. At the time of the visit of our artist, black Berkshire pigs were being slaughtered, and the white and black portions of the animal seen plainly indicate where the hair has been already removed in its passage through the machine. The accurately working spring scrapers of the machine are mounted on cylinders placed at such angles as will allow the blades to most effectually reach every portion of the animal, and in about ten seconds the hog emerges denuded of its hair. This work was done by hand some years ago, but the machine, which saves the labor of ten men, was invented and put in operation by one of the engineers of the firm in consequence of a strike of the scrapers, who did not imagine that machinery could be made which would perform their branch of the work.

The animal passes from the machine to hand scrapers, where any slight oversight is made good, after which follows a thorough washing by means of jets at the ends of rubber hose suspended over the table, to be directed as required for removing any adhering hair, dirt, or scum, perfect order and cleanliness being a marked feature of every detail. Next follows an inspection, after which the animal's throat is cut entirely across, so that the head hangs by but a slight connection, and the body is suspended by the hind legs from a trolley, and thus passed over the table where the disemboweling is performed. The leaf lard is removed at a following table, and further along the heads are removed and the tongues taken out, the last operation being the splitting, before the carcass is run into the cooling room, the time taken to catch the hog, slaughter, cleanse, dress, and deliver him in the cooling chamber being ordinarily only from ten to fifteen minutes.

Each portion of the internal organs is carefully separated, cleansed, and set aside for use, the lungs, heart and liver going to the sausage department, and the intestines, stripped of fat, cleansed and scalded, following to form the casings. Many kinds of sausages are made, among which are "liver," "blood," and pork, "Frankfurter" and "Bologna," while the soft parts of the heads are made into head cheese or brawn. The mincing of the sausage meat, which also includes trimmings from the sides and hams, is effected by steam-driven mincers operating in large vats. From hogs in good condition it is estimated that as much as forty pounds of lard is obtained on an average from each animal. The fat and other refuse is placed in tanks heated by worms from steam boilers, and after melting is drained off in different grades, the first quality being made only from the leaf and trimmings. Some of the bristles are used for brushes, and others go to the cobblers, but the great bulk of the hair is mixed with horse hair for stuffing cushions and similar purposes. The blood is largely used for making albumen for photographic uses, as well as in sugar refining and for a fertilizer, the crushed bones and other refuse also forming a very valuable fertilizer, although many other uses are likewise found for the bones.

After the carcass has been thoroughly cooled, in rooms which are always kept at a temperature below 40° F., it is run along, still on the labor-saving rails, to the cutting-up department, where it is taken down and separated into two sides, and then a workman with a powerful chopper cuts off the ham, shoulder, and underlying ribs if necessary, separating the feet to be canned, pickled, or passed into the lard tanks. It is wonderful to what accuracy these workmen attain, never mauling the meat, and always cutting to a hair's breadth just where the separating cuts for the different parts are required.

A large portion of the product of the slaughter houses is distributed in bulk to the principal markets of this country, the number of hogs slaughtered singly by farmers for general consumption being small; but the cutting and packing of hog products, for both the home and export trade, is a business of such enormous extent that it has been made the subject of very careful and exact rules, recognized by commercial bodies generally in all the important centers of commerce. The requirements of the Chicago Board of Trade in this particular may be somewhat briefly summarized as follows:

In barreled pork, standard mess must be from sides of well-fatted hogs, split through or on one side of the backbone, and equal proportions on both sides, 190 to 198 pounds of green meat to make a barrel, numbering not over sixteen pieces, including the regular proportion of flank and shoulder cuts, the packing to be done with forty pounds of coarse salt, and the barrel to be filled with brine. Prime mess is made of the shoulders and sides only of hogs weighing from 100 to 175 pounds, cut in square pieces of four pounds each, twenty pieces of shoulder cuts to thirty pieces of side cuts, and in addition to the salt twelve ounces of saltpeter are placed in each barrel. Extra prime pork is made from heavy untrimmed shoulders, and light mess pork is made from sides, but with as many as twenty-two pieces to the barrel. Extra clean pork has the backbone and ribs taken out, fourteen pieces to the barrel, and in clear pork the backbone and half the rib next to it is taken out.

In pickled meats, careful requirements are formulated for standard sweet pickled hams and shoulders, New York shoulders, Boston shoulders, California hams, skinned hams, pickled bellies, etc., while cut meats form the subject of a long list of regulations in which are described, among other things, what must constitute Cumberland, Birmingham, South Staffordshire, Yorkshire, Wiltshire, and Irish cut sides, South Staffordshire and Manchester hams, etc. The bacon put up for foreign consumption is usually packed in boxes holding about 500 pounds each, and much of the Chicago packed meat is retailed at many places in England and other foreign markets as of the choicest domestic production in the neighborhood where it is consumed.

The promised removal of the long standing restrictions upon the trade in American pork by Germany, France, and Italy will undoubtedly result in a large increase in our exports of hog products, the total of which for the last fiscal year, ended June 30, 1891, was $84,908,698. This sum is made up as follows: Bacon, $37,404,989; hams, $8,245,685; fresh pork, $56,358; pickled pork, $4,787,343; lard, $34,414,323. For the preceding year our exports of the same articles were $372,476 greater than during the last fiscal year.

Antiseptic Soap.

An antiseptic soap for physicians and nurses, which has been found to possess the property of closing scratches and healing sores and cracks, has been introduced by M. Vigier, and is having considerable sale in Paris. It is made of 12 parts dried sulphate of copper incorporated with 88 parts of any good soap material. The product has a pleasing green tint and is devoid of any irritating action.

The Trees for Hedges.

When barb wire fences became common, the opinion was generally entertained that hedges would be wanted no longer, being superseded by the wire fence. But hedges are not entirely given up, since it has been found that the strong objections made to them have arisen from the careless manner in which they have been treated, and often left to take care of themselves. Carelessly planted, many parts have died and left gaps, and with pruning neglected or performed at the wrong season, large vacancies have been left below. But they will not become important farm barriers to any extent, rather the ornamental boundaries of home grounds, or screens for protecting gardens from intruders or prevailing winds. Yet in some instances they may still be useful boundaries of farm fields, as an example of which we now have had for over twenty years an Osage hedge nearly a fourth of a mile long, which for more than that time has afforded perfect protection between cattle and horses on one side and fruit trees and plants on the other. It was cultivated on each side for a few years, until large enough, after which the soil was allowed to harden or become covered with grass to check the growth of the hedge and favor early ripening of the young wood. This result has been increased by a tile drain a few feet from it, giving the Osage plants a dry bottom. As a consequence, the hedge has never been injured to any extent by cold winters. It has been annually cut back enough to reduce the height to about six feet. It is perfect throughout, and no animal or any man has ever attempted to pass it. It has cost less, in the long run, than a good board fence. The *Cultivator and Country Gentleman*, from which paper we copy, mentions these facts because intelligent planters very commonly pronounce Osage orange not hardy enough for the North, and it is not under common treatment.

Much discussion has taken place lately on the best trees or plants for hedges. W. G. Waring gives his views in the *Tribune* after much experience. He strongly favors the barberry, which he has found sufficient to exclude ill-bred boys from the fruit garden, who previously disregarded barb wire and picket fence. The plants were set eight inches apart, had been pruned back enough to "present countless needle points from ground to summit." The objection is mentioned too that the barberry is unfavorable to the wheat crop, but this is not always the case, as we have barberry hedge and barberry bushes in close proximity to unblighted wheat fields, and in other instances we have seen promising wheat crops destroyed by rust, although no barberries were known to grow within miles of such devastated localities.

In the same journal, Andrew S. Fuller justly pronounces the common hemlock as forming the handsomest and most perfect hedge. For its rich green leaves and soft foliage it surpasses the Norway spruce and the arbor vitæ. Its dense growth in its own shade and in that of other trees might have been mentioned as an additional recommendation, in which it is unlike many other evergreens, which present a bare growth of denuded branches when the interior is examined by lifting the exterior foliage. This characteristic allows it to be used for screens (taller than hedges) in the shade of deciduous trees, and to give it a full rounded growth when other evergreens would lose their leaves.

Since the introduction of barb wire, a larger list of hedge trees may be made than formerly, a few strands of the wire passing lengthwise in the interior giving the same advantage to thornless branches as formerly possessed by dense thorns. Evergreens may thus become efficient barriers. The buckthorn, which has the advantage of being easily raised from seed, easily transplanted, and having a natural hedge-like growth, may have sufficient artificial thorns supplied it; and dense-growing ornamental shrubs may now be used in the same way, if the planter will add the wire to the interior as they gradually increase in height.

Animal Temperature and Food in Disease.

The *Lancet*, of July 27 ultimo, brings forward the question whether the animal temperature is reduced by change from an animal to a vegetable diet, or to a diet in which animal food forms a main part. It refers to a gentleman and lady who, under what is called the V.E.M. system (vegetable, eggs, and milk), seem to have brought down their animal warmth from 98° to 96°, with 97·4° Fah. as a maximum, and at the same time have remained in perfect health and strength. If this be true, it is argued, the assumed natural standard of the *genus homo* is above the required standard, and men and women are wasting their powers by an unnecessary dispersion of energy. It is suggested that we ought to ascertain, from a long, patient, and truthful series of observations on the temperatures of animal and mixed feeders whether, by changing them into pure vegetable feeders or fruit feeders, any modification of temperature is induced. The idea is a good one, but the research should be extended to observations on the effect of dietaries in the course of disease. We have no system in the treatment of disease, of febrile disease especially, that so much as touches this all-important matter. In high fever we give cold drinks, with broths and beef tea, guided more by what, from very crude ideas, we are led to think the stomach will bear, than by any forethought of what the substance, supplied as food, will do when it passes into the circulation. It is not known, elementary as the question is, whether the imbibition of cold water reduces temperature more decidedly than hot water; and when we come to foods, we have no sure knowledge whether those which are animal and fleshy, or those which are farinaceous, or those which are fruity are the most active antipyretics. Perchance there might be discovered some food and drink that of itself would be sustaining and antipyretic. I am usually led by what is called the "instinct" of the patient in directing foods and drinks, and my late friend Mr. Thomas Hunt, a shrewd and original observer, wrote once an essay to prove that instinct was an infallible guide for food in disease. It is a doubtful doctrine, but possibly up to date as good as any other, if not the best.—*Dr. B. W. Richardson.*

Climatology in Relation to Childhood and Old Age.

As regards childhood, we may safely lay down the general laws that children respond more readily to change than their elders, that they commonly do very well at the seaside, that they often benefit most signally by a sea voyage, and do not suffer severely from the discomforts attending such a voyage, that they enjoy and benefit by a country life, that they suffer more than grown people from the depressing influences of city life, and that, as a rule to which there are probably many exceptions, they do not specially benefit from the climate of high altitudes. Such, in brief, seem to be the leading principles of the climatology of childhood and early adolescence. That children love the sea and that the sea very generally suits them are familiar facts of observation. The explanation is to be found in such considerations as that children are commonly in a condition to bear stimulation, not having used-up nervous systems, that they are attracted by the sea and its products, and by the amusements natural to the seaside, and that some of their commonest ailments, such as struma and rickets, are among the affections most amenable to marine influence.

It is very striking how happy children are, as a general rule, on shipboard; how readily they accommodate themselves to their novel conditions of existence; how little they suffer from sea sickness or the other inconveniences of the life at sea; how deeply they are interested by the rather monotonous round of sights and sounds, and how astonishing is frequently their progress toward health under such conditions. The enjoyment and benefit which children derive from country life do not call for comment. That city life, especially under the insanitary and unwholesome conditions prevailing in many of our large centers of population, is prejudicial to the normal and healthy development of the child is a fact sufficiently obvious, but for which it is difficult to find an adequate remedy. The question is too large to be discussed incidentally in this connection, but it is not too much to say that the great problem in hygiene which the twentieth century will be compelled to solve will be how to reconcile the growth of great cities with the preservation of the national health.

That the mountain climates are not very suitable for children is probably a true general principle, but one upon which it would be rash to insist too rigidly. The explanation would appear to be that, upon the whole, the general conditions of climate and life which exist at high altitudes, although highly stimulating in certain morbid conditions, do not promote in a similar degree normal physiological development. We must admit, however, that this point has not been at all adequately worked out, and that any hard-and-fast rules are at least premature.

The climatology of old age may be roughly summed up as follows: Elderly people in general do well with equability and moderate warmth; they bear cold badly; they benefit by abundant sunshine. The high altitudes are very rarely suitable to them, and are usually decidedly injurious; they do best in level places, where there is abundant shelter. They may or may not benefit by the seaside or a sea voyage, but these measures cannot be recommended with at all the same confidence as in the case of children. Most of these principles become almost obvious upon a little consideration. The failing vitality, by which we mean impaired vigor of circulation, assimilation, and excretion, which characterizes advanced years, and the special maladies most frequent at that time of life, such as rheumatism, cardiac disease, gout, and renal affections, serve to determine the climatological problem. Moderate warmth with fair equability, abundance of sunshine with adequate shelter, and level walks, evidently meet the most obvious indications called for by these affections.

The unsuitability of the mountain climates to the aged is due partly to the cold, which depresses those in whom the circulation is feeble either constitutionally or as the result of age, partly to the sudden changes, which are especially trying to the rheumatic or the subjects of renal disease, partly to the impossibility of obtaining sufficient easy exercise on the level ground, which is a serious difficulty in cardiac cases. A sea voyage, though by no means out of court at any period of life, is often a doubtful experiment for the old, who do not take kindly to such a revolution in their daily habits as life at sea necessarily involves, who often suffer severely on shipboard from sea-sickness and insomnia, and who may not possess sufficient elasticity of spirit to rise above the depressing influence of separation from home and friends. The elderly constitute the class most likely to benefit by the various spas, which now enjoy at least a sufficient vogue. The effect of mineral waters is in most cases to promote elimination, and this is often the first indication in the case of those advanced in years. It should never be forgotten, however, that vigorous eliminative measures are a great drain upon the system and may easily be abused.

We hardly need to say, in conclusion, that in nothing is the superior recuperative power of youth over age more apparent than in the greater readiness and certainty of its response to change of climate. We can confidently recommend to the young measures which we suggest dubiously to the old. In fact, change is rarely at fault in the earlier years of life, whereas it is very often a doubtful, and sometimes a most hazardous, experiment for the aged. In the case of the latter we need to have solid reasons and tolerably definite prospects before we induce them to give up the comforts and safety of home for the uncertainties of travel —*Lancet.*

Cycling: Its Use and Abuse.

Those who believe in the necessity of physical exercise, and we belong to their number, have need also to remember that even so good a thing as this is in excess an evil. The use of the cycle is a form of bodily recreation in itself doubtless wholesome; none the less is it open to the mischievous effects of undue indulgence. Tempted by the ease of movement, combined as a rule with attractive scenery, every one trys it. Every one too finds he can do something with it, and considerations of weather, constitution, age, and health are apt to be dismissed with summary imprudence. One fruitful source of injury is competition. In this matter not even the strongest rider can afford to ignore his limit of endurance. The record breaker, who sinks exhausted at his journey's end, has gone a point beyond this. The septuagenarian who tries to rival his juniors by doing and repeating his twenty or thirty miles, perhaps against time, is even less wise. Lady cyclists, too, may bear in mind that their sex is somewhat the weaker. So likewise among men the power of endurance varies greatly, and it is better for some to admit this and be moderate than to labor after the achievements of far more muscular neighbors. In short, whenever prostration beyond mere transient fatigue follows the exercise, or when digestion suffers and weight is markedly lessened, and a pastime which ought to exhilarate becomes an anxious labor, we may be sure that it is being overdone. He that would reap its best results must content himself with much less than this; but unless he can observe such moderation, he had better abstain from it altogether.—*The Lancet, London.*

New Coloring Matter.

It is said: Some Belgian manufacturers of glass and porcelain have recently introduced from Germany a new coloring matter, which can be fixed without the use of fire. In this process a mixture of two solutions, of which one consists of 100 parts of strong potash and 10 parts of acetate of soda, and the other of 15 parts of acetate of lead in 100 parts of water. The second solution consists of 50 parts of borax dissolved in 100 parts of hot water and 20 parts of glycerine. Sixty parts of the first mixture are mixed with 40 parts of the second. When the composition has been applied, the objects are placed in a bath, which is composed of 1 part of borax dissolved in 12 parts of water, mixed with 50 parts of hydrofluoric acid and 10 parts of sulphuric acid. After being allowed to remain in the bath for ten minutes, the objects are washed in clean water, when the color appears as clearly as when the objects are fired.

Failure of the Galveston Harbor Works.

After more than twenty years of experiments, frequent changes of commanding officers, several modifications of plans, the expenditure of $2,273,111.66 to June 30, 1890, and more than a quadrupled estimate of cost to complete, it may be said that the injuries caused by the works are greater than the benefits, and that the difficulties in the way of securing a deep water channel over the outer bar have been greatly increased rather than diminished, while it is proposed to apply $6,200,000 to a continuation of these experiments on a plan which must prove fatal. Such is believed to be a frank, though greatly abridged, statement of the problem of securing deep water at Galveston, as it exists to-day.—*Lewis M. Haupt, C.E.*

Correspondence.

Practical Use of a Small Electrical Power.

To the Editor of the Scientific American:

I have a battery (primary) charging two cells of storage battery, which has been in daily use for nearly a year without once failing. From the storage cells I run a motor, one-eighth horse power, giving me power enough for *all* dental operations, viz., my dental engine used in the mouth and the lathe for grinding and polishing, the electric mallet and mouth lamp. The power is fully equal to the demand at all times. As you well know, the secondary battery needs no attention whatever, and all that I have ever done to the primary battery is to pour out the water once in two months, and put in about four pounds of blue vitriol to each jar. There are ten jars of primary coupled to give five volts and about one ampere; as a matter of fact, it will give more than one ampere during the two months, but after that period the quantity lessens. The cost of maintaining this is about 75 cents per month, and it requires about one hour to renew, if all the cells are cleansed at the same time, which is not necessary. The capacity of the storage cells is 4 volts and 35 ampere hours. This summer, before I went on my vacation, I discharged the secondary battery, and in so doing ran the motor without load for six hours continuously before it stopped. J. E. STANTON.

Boston, Mass., October 14, 1891.

[The above account of Dr. Stanton's experience contains information of value to a large number of our readers who are interested in the practical use of electricity in a small way. We would be pleased to hear from others having a similar experience.—ED.]

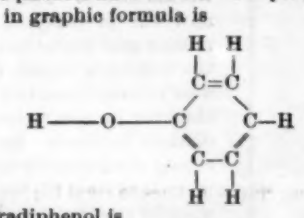
The Formula of Amido-phenol.

To the Editor of the Scientific American:

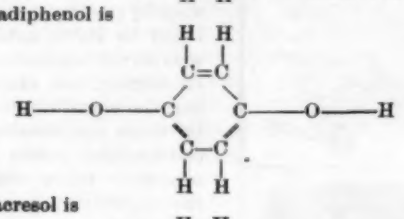
In issue dated October 17, in answer to E. B. C., you give the formula for paramidophenol as

$$C_6H_4(NH_2)OH$$

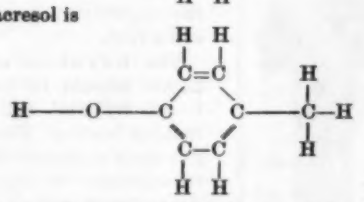
The phenols have six C's. Simple phenol, or carbolic acid, in graphic formula is



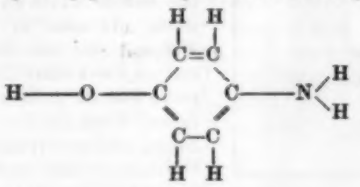
Paradiphenol is



Paracresol is



Consequently paramidophenol would be graphically



or $C_6H_4(NH_2)OH$

instead of $C_6H_4(NH_2)OH$

Am I not correct? HERBERT B. TUTTLE.

[The formula should read as you give it—
$C_6H_4(NH_2)OH$.]

The Tides.

To the Editor of the Scientific American:

If Newton's theory accounting for the tides is correct—of which I presume there is no doubt—can it not be proved, and the amount of the attraction of both the sun and moon upon the earth be ascertained, by the means suggested below?

It appears to me that at new moon a properly adjusted water wheel with a given amount and temperature of water, and under a given head, should make a larger number of revolutions at 6 o'clock than it could make at noon, as at noon the attraction of both sun and moon would be counter to the earth's attraction, and would decrease the weight of the water, while at 6 o'clock their attraction, being at right angles to the earth's, would have no effect upon the weight of the water. WARD STONE.

[Your idea of the relative difference of the sun, and moon's attraction at noon and night is no doubt true; but the direct attraction of the sun's and moon's force does not agree with the tidal development which follows the moon's position by six hours. Whatever the difference is, in the gravity of falling water, it will be least at noon and greatest at midnight at time of new moon; since the moon's mass is only about one-eightieth of the earth's, and its distance thirty times the diameter of the earth, the lifting force at a point upon the earth's surface which has the moon in the zenith, expressed as a fraction of the earth's gravity, equals $\frac{1}{8,000,000}$, or a body of water weighing 4,000 tons has a total variation in weight of about one pound, due to the position of the moon, whether in the zenith or nadir. Attempts have been made to observe directly the variations in the force of gravity produced by the moon's action, but they are too small to be detected with certainty by any experimental method yet considered. The differential force of the sun is so much smaller than that of the moon that it may be left out in questions of the above kind, and is only manifest in the problem of the precession of the equinoxes.—ED.]

Is it Mineral Wax?

To the Editor of the Scientific American:

There is a legend among the Indians here that a Spanish vessel loaded with beeswax was wrecked on the beach near here about one hundred years ago. On the beach at the mouth of Nehalem River, in this county, about forty miles south of the mouth of the Columbia River, is found large quantities of wax, having the appearance of a mineral, at first sight, but on closer inspection and with ordinary tests appears to be pure beeswax. In fact it is gathered and sold as beeswax, and one man residing at Nehalem makes a regular business of gathering it and shipping it to Astoria, where he receives the regular market price of beeswax.

It is washed ashore at high tide, apparently having been unburied from the shifting sand bars by the waves, and it is common to see a man plowing on the beach to unearth the treasures of wax. It has also been found at quite a distance from and considerably elevated from the beach, in the black soil, where large trees are now growing. It occurs in pieces of various sizes, from the size of a walnut to one hundred and fifty pounds, and some of the larger pieces are said to have borne inscriptions in some unintelligible language. The Indians use it for torches.

Inclosed you will find a small piece, and if you are unable to determine from this what it is, will send you more, as it is very plentiful in this county, almost every one having samples on their mantelpieces.

W. F. D. JONES.

Tillamook, Oregon, October 10, 1891.

[The specimen is probably mineral wax. The fact that it is found in the soil at a distance from the beach and elevated above the sea level entirely discredits the Indian legend.

The occurrence of mineral wax or resins in the lignite beds of the Northwest and British Columbia has been known for several years. The results of partial examination of specimens were published in the Geological Survey reports. The occurrence in quantity indicates the possibility of a Cretaceous or Tertiary lignite bed in the neighborhood. The wax belongs to the hydrocarbon series allied to the retinites and ambers—the fossil remains from the resinous trees of the Tertiary age.—ED.]

Leprosy in China.

To the Editor of the Scientific American:

I read with much interest an article on "Leprosy" in September 19, 1891, number of the SCIENTIFIC AMERICAN; and after reading the article in question it struck me that your readers perhaps might be interested in knowing what ideas are prevalent with regard to the dreaded disease which formed the substance of the said article in your valuable paper, in a country like China, where it has been flourishing for so many centuries.

Having lived in China for a number of years, and having traveled extensively during that time in the service of the Chinese government, I have often come upon whole districts and towns where leprosy was prevalent; and speaking and reading Chinese fairly well, I made several inquiries, with a view of ascertaining the natives' ideas as to the origin, spread, and prevention of that fearful disease.

On one occasion I came upon whole leper colonies at, and close to, the city of Yen Ping, in the province of Fu-chien. I asked the prefect of Yen Ping Fu if he knew anything about the cause of the disease (which in Chinese is known as Ma Feng) and what steps the local authorities took to prevent the spread of the disease. He answered me that very little was known about the cause, but that leprosy was about as old as China itself. It is, however, probably caused, he said, by "a small animal, but so small as to be invisible to the eye, and on the whole not perceptible to the senses at all." This struck me at the time as very interesting, as it proved that the Chinese had made a shrewd guess—ages before the "civilized West"—at the now so commonly discussed bacillus. The prefect further said that the general idea was that the seeds of leprosy entered the *rice* through the water in certain localities, and that it was through the food that the disease to some extent was propagated, and of course through actual *bodily* contagion! There were numerous asylums at Yen Ping Fu for lepers, but they were allowed to go about a good deal. The lepers in the said district were allowed to intermarry, but no marriage was allowed between healthy people and those suffering from leprosy. I was shown a good many young boys and grown-up girls, several of whom showed no outward signs of the disease, and several of whom even were very good-looking, but who nevertheless all of them had the taint of the disease. The Chinese claim to be able to recognize the existence of the disease in such cases by the peculiar, nearly *abnormally healthy* complexion! The guess at the bacteria is said to have been made many centuries ago; many remedies (all, or most, of which were exceedingly unlikely) have been proposed from time to time, but the prefect said that really there was no remedy, and only one way of preventing the spread of the disease, namely, by keeping the lepers strictly in their asylums and prohibiting marriage of lepers altogether, and thus stopping the spread of leprosy by *contagion* and *heredity!*

There are many superstitious notions in existence in China with regard to the cure of the disease. Thus a Chinese official told me that many of the natives thought that a person suffering from leprosy could be cured by marrying a healthy person of the opposite sex; and great cunning has often been used to conceal the disease, and thus carry out matrimonial plans of such kinds, with a view of curing either the son or daughter as the case might be.

This, of course, proves the ignorance of the masses and also how still further new channels are opened for the propagation of the disease. On another occasion a women offered me and a friend some "peanuts"; an official who was traveling with us rushed up, saying only: "Ma Feng, pu mai," which means: "Leprosy, don't buy," which proves that the Chinese are fully convinced that the contagion can be communicated by touching or eating anything which has been handled by lepers; and it also proves, as your correspondent of September 19 mentions, the great risk one unknowingly runs in buying fruit or any other kind of produce coming from places where lepers are allowed to go about at large. Whatever some "western" physicians may say as to the non-contagion of the disease, I think no sane person will deny that the experience gained through *thousands* of years in a country like China must and does prove something, especially as after all most of our present knowledge of medicine is based on observation and tradition. Besides, the Chinese knew the use of vaccination as a preventive against small pox more than six centuries ago; and, although they of course do not possess our knowledge of chemistry and surgery, they have always been careful recorders of history within their own sphere of knowledge. "V. G."

Vancouver, B. C.

Long Distance Electrical Power.

At a recent meeting of the Engineers' Club, Philadelphia, the secretary read, for Mr. Coleman Sellers, a letter communicating information obtained from recent letters from Switzerland respecting the electric transmission of power from Lauffen to Frankfort, a distance of 175 kilometers, or about 100 miles.

A 300 horse power turbine at Lauffen supplies power to a three-phase dynamo which furnishes currents of 65 volts, which are at once transformed to 25,000 volts and carried to Frankfort by a three-wire line, each wire having a diameter of 4 millimeters.

The wires are carried by porcelain insulators with oil grooves, on wooden poles about 50 meters (164 feet) apart. At Frankfort, the high tension current is retransformed to an alternating current of 65 volts. This current supplied (on the evening of September 14) 1,000 incandescent 16-candle lamps and a three-phase receiving dynamo of 100 horse power.

From considerations of safety, the horse power developed at Frankfort has not yet exceeded 120 horse power, and the tension actually used has not exceeded 15,000 volts, the quantity reaching only 1,500 amperes. The 100 horse power dynamo furnishes at present only 40 horse power to a centrifugal pump.

Owing to the false indications given by ordinary amperemeters and voltmeters, the number of watts recorded is greater at Frankfort than at Lauffen.

Thought Transference.

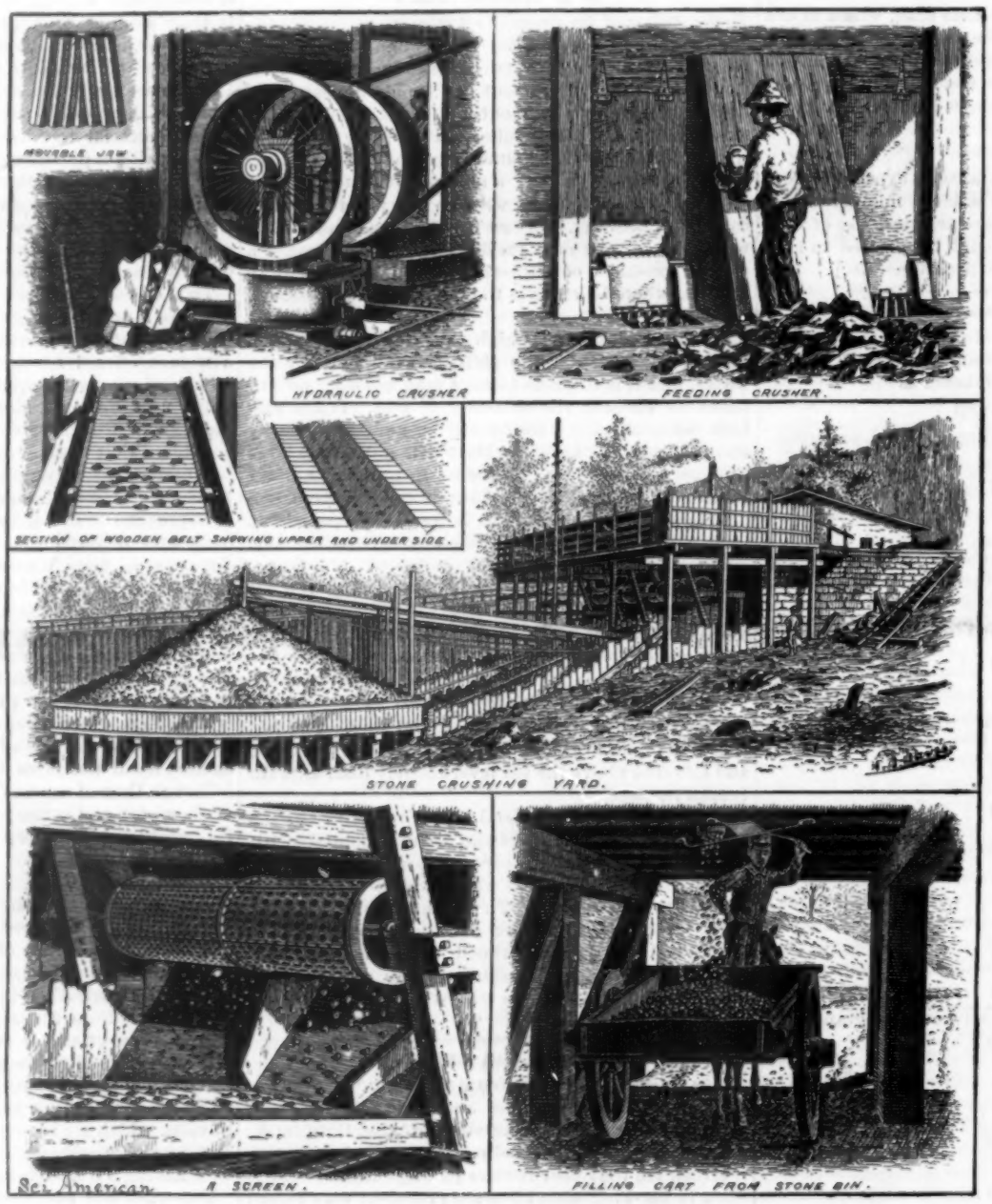
Professor Lodge, president of the section of Mathematics and Physics at the late meeting of the British Association, used the following language: "May there not also be an immaterial (perhaps an ethereal) medium of communication? Is it possible that an idea can be transferred from one person to another by a process such as we have not yet grown accustomed to, and know practically nothing about? In this case I have evidence. I assert that I have seen it done and am perfectly convinced of the fact."

HOW STONE IS CRUSHED AND SCREENED.

The stone-crushing establishment shown in the illustration is situated near the West Shore R. R. depot at Weehawken, N. J., and is fitted up with three Blake hydraulic crushers and the necessary screens and elevators. The crushers are made of cast iron, about 6 inches in thickness, and the feed opening at the top is 15 inches in length and 7 inches in width. Each crusher has a stationary vertical jaw and a movable jaw swinging on a pivot to approach the other. Both jaws are fluted, the ridges of one jaw being opposite the grooves of the other. The movable jaw, which approaches to within ¾ of an inch of the bottom of the other, is made in two sections, so that the fluted part when the ridges are worn out can be replaced by a new one, which is fastened in place by means of key bolts. On the back and lower half of the movable jaw is a groove about 4 inches in height and 3 inches in depth, in which rests the larger end of a V-shaped toggle plate, 4 inches thick, 14 inches wide, and about 17 inches in length. The small end is round and rests loosely in the end of a small 9 inch cylinder, the end where the toggle plate rests being shaped inside like a druggist's mortar about 5 inches in depth. This small cylinder slides into a large 20 inch cylinder, and when the wheels of the hydraulic engine revolve, the piston or plunger which runs through the top of the large cylinder descends and presses the 1 gallon of water which the cylinder is supplied with against the small cylinder. A 3 ton pressure is thus given which drives the small cylinder forward, with the toggle plate and movable jaw, the latter being moved up to within ¾ of an inch of the bottom of the fixed jaw, and breaking all the stone between the jaws.

Connected to the movable jaw, and running underneath the cylinder, is an India rubber spring which draws the jaw back as the plunger ascends. As the stone is broken it falls into a chute on the under side of the crusher and passes into a circular iron screen which is perforated with different sizes of holes. This screen is 3 feet in diameter, 8 feet in length, and made of ¼ inch iron. It is made in ten sections securely bolted together. The holes in the screens are 1, 1¼, and 2½ inches in diameter. The screen is hung at an angle so that the larger pieces of stone as they fall into it will roll down to the lower end and pass through the large holes to the elevator below.

The elevator is about 50 feet in length and runs out to the center of a large stone bin. The sides are made of heavy timber, about 2 feet apart, and running between them on 3 inch wooden rollers is an 18 inch wooden belt made of strips of wood 2 inches in width and 1 inch in thickness. These are fastened closely together by means of a 12 inch rubber belt running across the center and screwed fast to the under side of the strips. The stone as it falls from the screen drops on to this wooden belt and is carried out to the end of the elevator, where it falls down into the stone bin. The bin is elevated about 7 feet from the ground and rests on 12 by 12 timbers, which are placed far enough apart for a cart to back in underneath the bin for a load of stone. Projecting down from the bottom of the bin about 6 inches is a 7 inch iron pipe covered at the bottom with an iron plate. The cart is backed directly under this pipe, when the driver pushes the plate one side and down comes the stone, which fills up the cart in about two minutes. The plate is then pushed back again over the mouth of the pipe until the next cart comes. The stone is sold by the cubic yard. One stone breaker will crush from 50 to 60 yards of stone every 10 hours. The establishment is run by steam power, a 24 h. p. engine being used. The plant is owned by John Murphy, of West Hoboken, N. J., and cost about $10,000.



IMPROVED STONE CRUSHING MACHINERY.

Name Plate Metal.

A good material for engine name plates and the like may be made as follows: To 100 parts by weight of copper thoroughly melted add successively, each being carefully pulverized, 6 parts of magnesia, 57 of sal ammoniac, 18 of quicklime and 9 of cream of tartar. Stir constantly while adding the above, then add 15 parts of either zinc or tin in small portions, the stirring being continued until the whole is thoroughly melted and mixed. After resting in a molten condition for half an hour, the surface is skimmed and the metal made use of. The resulting metal has a fine grain, is easily polished, is malleable and is slow in tarnishing.

The Influence of Diet on the Growth of Hair.

In the *British Medical Journal* for July 25, Dr. E. D. Mapother says: "Several cases of shedding of hair after influenza have confirmed my opinion that diet has much to do with the production and with the cure of symptomatic alopecia. Hair contains five per cent of sulphur, and its ash twenty per cent of silicon and ten per cent of iron and manganese. Solutions of beef, or rather of part of it, starchy mixtures, and even milk, which constitute the diet of patients with influenza and other fevers, cannot supply these elements, and atrophy at the root and falling of hair result. The color and strength of hair in young mammals is not attained so long as milk is their sole food. As to drugs, iron has prompt influence. The foods which most abundantly contain the above-named elements are the various albuminoids and the oat, the ash of that grain yielding twenty-two per cent of silicon. With care these foods are admissible in the course of febrile diseases, when albumen is the constituent suffering most by the increased metabolism. I have often found a dietary largely composed of oatmeal and brown bread greatly promote the growth of hair, especially when the baldness was preceded by constipation and sluggish capillary circulation. Those races of men who consume most meat are the most hirsute. Again, it is well known in the zoological gardens that carnivorous mammals, birds, and serpents keep their hair, feathers, or cuticle in bad condition unless fed with whole animals, and the egesta contain the cuticular appendages of their prey in a digested or partly digested state."

The Hospice of the Great St. Bernard.

This asylum for the Alpine wayfarer (7,609 feet above the sea level) is said to have been founded A.D. 962 by St. Bernard of Menthon, while, according to some authorities, it rose a century earlier, under Charlemagne. Neither saint nor emperor is likely to make good his claim, as the archives of the hospice have been completely destroyed in two successive conflagrations. But like other Christian institutions, it had undoubtedly a pagan predecessor. The Romans on the self-same spot built a temple to the Pennine Jove, and that, in turn, occupied the site of a still earlier shrine of prehistoric antiquity. The truth is, the Alpine passes were in common use from the remotest ages—the Christian world treading the same route which had been trodden by the Romans, who also availed themselves of the track made by the aborigines. At its highest point the tutelary deity had his place of worship, and this was served by the local priesthood, who rendered assistance to the distressed or ailing traveler and received votive tributes in return for its good offices. The existence of a temple of Jupiter on the spot, with its staff of priests, is well known; and the relics that have turned up near it attest its uses to have been similar to those of the present hospice. A discovery of importance has just been made in its vicinity—a bronze statue in excellent preservation of Jupiter himself. Its artistic value is very great; its height, forty centimeters. At the same time other treasure-trove was brought to the surface, including a number of medals and a statuette of a lion measuring sixteen centimeters, also of fine workmanship. These are now the property of the monks, and will attract to the hospice a public more able to keep them in funds than the proper recipients of their kindness. Sad to relate, the revenues of the monastery, heavily drawn upon by the travelers (from 16,000 to 20,000 annually) who throw themselves on its bounty, are diminishing, the contributions left by these comfortably accommodated guests being miserably below what, in the majority of cases, they can afford.

The heroism of the monks should be remembered by the well-to-do holiday visitor. They begin their career at the age of eighteen or nineteen. After fifteen years' service the severe climate has made old men of them. For eight or nine months out of the twelve they see none but the poorest wayfarers, when the cold is intense, the snow lying deep, the danger from storms incessant and fearful. Their sole companions are the dogs, whose keen scent has guided them to the snow wreath under which the buried traveler has so often been rescued and brought to life—dogs like that noble fellow "Barry," who saved forty men in his time, and who now, carefully stuffed, adorns the museum at Bern.—*Lancet.*

Interesting Discovery in Egypt.

The correspondent of the London *Times* at Alexandria telegraphed on October 11 that three colossal statues, ten feet high, of rose granite, had just been found at Aboukir, a few feet below the surface. The discovery was made from indications furnished to the government by a local investigator, Daninos Pasha. The first two represent in one group Rameses II. and Queen Hentmara seated on the same throne. This is unique among Egyptian statues. The third statue represents Rameses standing upright in military attire, a scepter in his hand and a crown upon his head. Both bear hieroglyphic inscriptions, and both have been thrown from their pedestals face downward. Their site is on the ancient Cape Zephyrium, near the remains of the temple of Venus at Arsinoe. Relics of the early Christians have been found in the same locality.

Microbes and Carpets.

In our endeavor to be comfortable in this vale of tears, there is a tendency to overlook the elementary laws of hygiene, and in no respect, perhaps, more so than in the superabundance of curtains and carpets—those non-patented contrivances for hindering the free circulation of fresh air and stultifying nature's automatic arrangements for the deodorization and disinfection of our homes. Carpets are always objectionable when they are not designed to permit of easy removal for cleansing purposes without the necessity of turning a room topsy-turvy. In most houses the carpet only comes up once a year, by which time it is as full of microbes and accumulated filth as its interstices will allow. No wonder, then, if our rooms preserve a musty smell in spite of periodical opening of windows and vigorous sweepings, which only displace a portion of the dust to settle promptly elsewhere in some less accessible spot. Fixed carpets are even more objectionable and unwholesome in bedrooms, for there they absorb the fetid emanations of the night, and soak up various decomposable materials for future use. The ideal would be a polished wooden floor garnished with rugs in sufficient number to give an aspect and feeling of comfort, while admitting of easy exposure to the salutary influence of air and light. Rugs, carpets and curtains ought to be frequently shaken and hung up in the fresh air if they are to remain sweet, not once a month or year, but twice or thrice a week, if not oftener. At this price only can we hope to deprive confined spaces of their native unwholesomeness, and the sooner housewives lay this maxim to their hearts and act upon it, the better.—*Hospital Gazette.*

Union Label—Trade Mark.

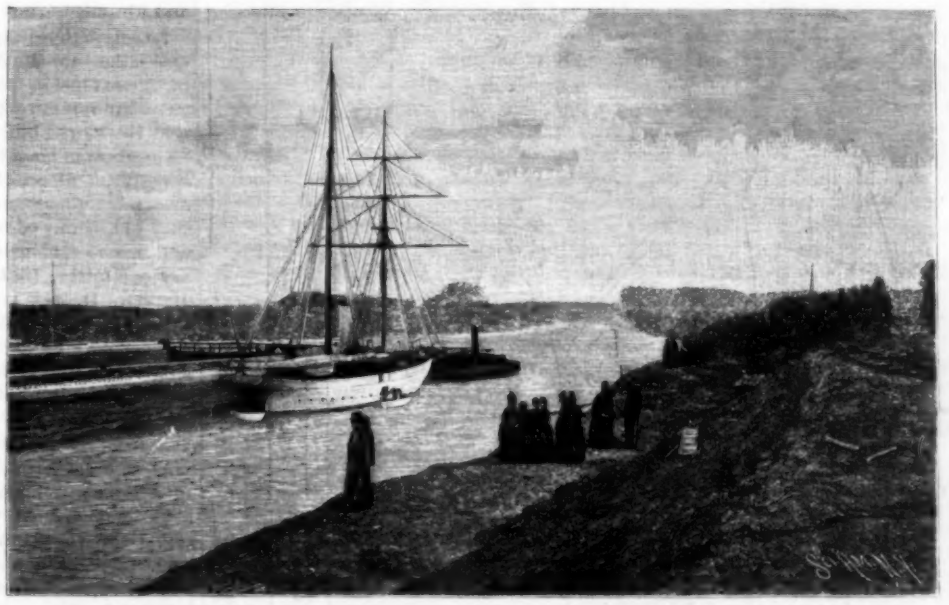
An interesting decision has just been rendered by the Supreme Court of Pennsylvania in a suit brought by Cigarmakers' International Union No. 126, of Ephrata, against one Brendle, to restrain him from using the Cigarmakers' International Union label on his goods. The defendant was a union manufacturer who had incurred the ill-will of local officials, and declined to use their labels, but issued similar labels or trade marks of his own. The union secured an injunction in the court below, but the Supreme Court reversed the decision of the court below on the ground that the Cigarmakers' Union, formed for the mental, moral, and physical welfare of its members, was a personal and social organization, not a commercial one, and, therefore, could not own a trade mark under the laws of Congress. It appears that the union label described the cigars it accompanied as being made by first class workmen, stigmatized all cigars not having the label as of inferior workmanship, and recommended the union cigars to all smokers throughout the world. In its decision the court said: "This is an attempt to use the public as a means of coercion in order to find a market for their goods or labor. A first-class workman is one who does first-class work, whether his name is on the rolls of any given society or not. Filthiness and criminality of character depend on conduct, not on membership of the union. Legitimate competition rests on superiority of workmanship and business methods, not on the use of vulgar epithets and personal denunciation. The International Union in this case has an avowed purpose to do harm to non-union men, to prevent the sale of their work, to cover them with opprobrium, and they ask a court of equity to say they have a right to do so. We decline to say so."—*Bradstreet's.*

THE finest stationary engines made in the world, for economy, durability, and elegance in design, are made in the United States. English engines are often bulky and clumsy. French engines are frequently erratic in design and fragile in construction.

THE MANCHESTER SHIP CANAL.

This great engineering work is now rapidly approaching completion, and will soon be in full operation. The first completed section, from the entrance at Eastham on the river Mersey to Weston, was opened for traffic on the 29th of September. The length of this completed portion is eleven miles, being almost one-third of the entire length of the work.

The first consulting engineer was appointed (to look into the project and report) in the summer of 1882. It was only in August, 1885, after making three trials, that the sanction of Parliament was obtained for building the canal. Before a single sod was turned in the great work, $1,750,000 was spent in forwarding and contesting the canal project. In July, 1886, the contract for building the entire canal was let to Mr. Thomas Walker for $28,750,000. The allowed time for finishing the work was four years, with a large bonus for whatever time was gained in finishing.



THE MANCHESTER SHIP CANAL—VIEW FROM LOCKS LOOKING ALONG THE CANAL.

The canal extends from Eastham Locks on the south bank of the estuary of the Mersey River to Manchester, having a total length of a little over 35 miles. The minimum width on the bottom is to be 120 feet. The depth throughout is to be 26 feet. This is a very large cross section when compared with existing canals, which are as follows:

Ghent canal, 55 feet 6 inches wide on the bottom, 21 feet 2 inches deep.

Suez canal, 72 feet wide on bottom, 26 feet deep.

Amsterdam, 88 feet 7 inches wide on bottom, 23 feet deep.

Quite satisfactory progress has been made on the entire work, but the sudden death of Mr. Walker, the energetic contractor, proved rather embarrassing.

Mr. E. Leader Williams is the chief engineer of the work and has been one of its principal promoters from the beginning.

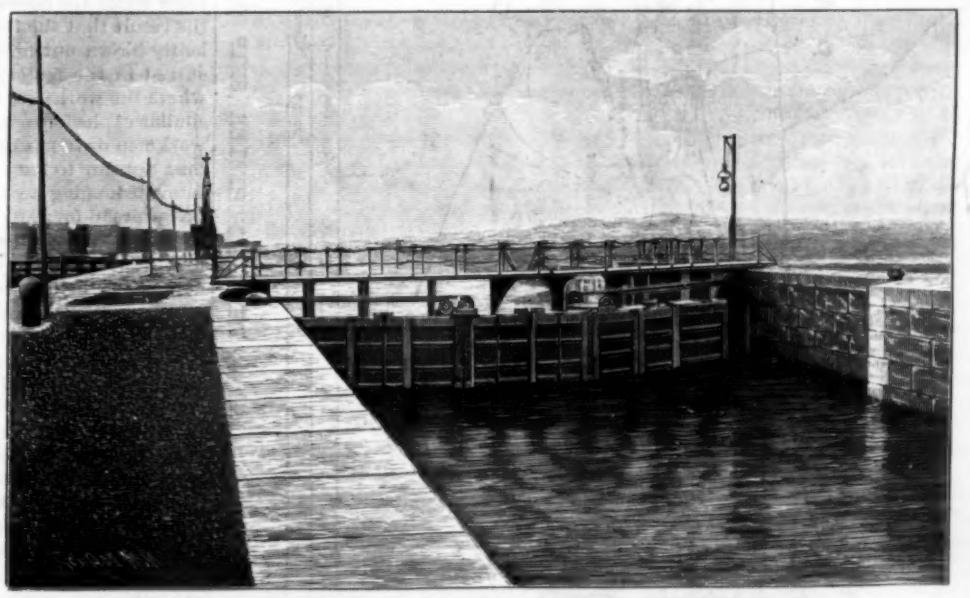
The canal is 48 feet wider than the bottom of the Suez canal, while the depth is equal; so that the largest cargo steamers can pass each other in the Manchester ship canal. At several points, near the locks and near the docks, this canal is wide enough for such ships to turn. For a length of three miles and a half, approaching Manchester, the width at the bottom is 170 feet, so that ships can lie outside the docks along the wharves on the Salford side. There will also be open side basins, or widenings at ship building yards, or where cargoes are discharged or loaded, for manufacturing establishments or storehouses adjoining the canal.

Five sets of locks—at Eastham, on the Mersey sea estuary; at Latchford, on the Mersey, above Warrington; at Irlam, above the junction of the river Irwell with the Mersey; at Barton, on the Irwell; and at Manchester—raise the level of the canal, on the whole, 60 feet above the sea. Of its entire length, twenty-three miles, inland from Runcorn to Manchester, will have been formed by cutting a straight and deep channel for the rivers Mersey and Irwell. The lower section, from Eastham to Runcorn, forms a curved line of twelve miles along the Cheshire shore of the broad inner expanse of the Mersey estuary; but at Weston Point, meeting the estuary of the navigable river Weaver, which is connected with an extensive system of canals, it will obtain valuable local traffic, especially the shipment of salt. A large trade with Cheshire and the Staffordshire potteries, by the Bridgewater canal, will also reach the ship canal at Runcorn, as well as that of the chemical manufacturers at Widnes. The Shropshire Union canals will feed the traffic at Ellesmere Port, near Eastham.

The Manchester docks, formed on both banks of the Irwell, chiefly in Salford, but also in Manchester on the site of the Pomona Gardens, Cornbrook, and extending to Throstlenest and the Albert Bridge, near the Old Trafford Road, will afford ample accommodation to the trade of that city. They occupy a space of two hundred acres. The water area of the dock basins is sixty-two acres and a half, and the quay frontages are three miles and a half in aggregate length, to which may be added a mile of open wharves along the wide part of the canal just below; and there will be two miles and a half of the canal bank, lower down, available for discharging cargoes into barges and lighters, and putting them ashore. Fifty hydraulic cranes, some of great power, will be provided at the Manchester and Salford docks.

The docks at Warrington, twenty-two acres and a half in extent, will have a railroad connection with the London and North-western and the Great Western Railway, which will bring a large coal and general traffic.

At Runcorn, at the head of the Mersey estuary, the docks belonging to the Bridgewater Canal Navigation, having been purchased by the Manchester ship canal, will always be accessible, instead of being entered only at spring tides as hitherto; the local trade advantages here, as well as those of the docks at Weston Point, for the Weaver navigation, have already been noticed.



THE MANCHESTER SHIP CANAL—VIEW OF ONE OF THE LOCK GATES.

The ship canal will be entered from the sea, or rather from the Mersey estuary, about four miles above Birkenhead, by the tidal locks at Eastham, all the gates of which will be open at high tides. The sills of these entrances will be 11 feet lower than the deepest dock sills at Liverpool or Birkenhead; and the channel approaching them will be dredged 3 feet deeper than the lock sills.

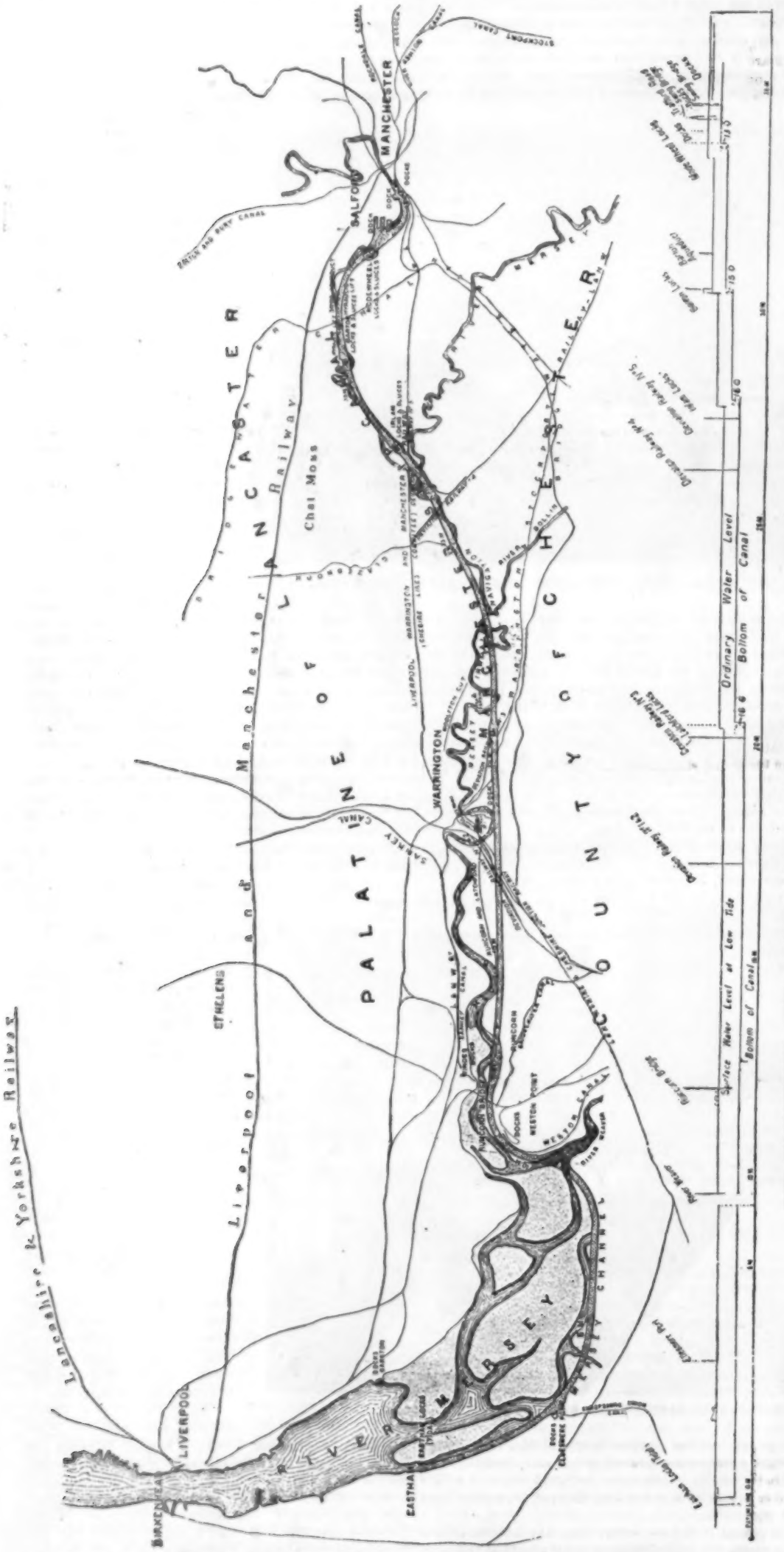
One of the great causes of expense has been the erection or reconstruction of railway bridges crossing the canal, each at a high elevation, to give a clear headway of 75 ft. above the water, and with the approach lines of railway to rise by moderate gradients on each side. The Cheshire Lines Railway at Irlam, the Wigan Junction line, the Warrington and Stockport line, the Grand Junction line at Warrington, and the London and North-Western Railway at Runcorn, must be treated with such costly alterations. The Barton aqueduct of the Bridgewater canal across the Mersey is replaced by an opening swing bridge, which is an iron trough, closed at each end when the bridge is opened, to contain the water of the Bridgewater canal, held thus safely above the level of the ship canal.

There will be hydraulic lifts by which laden barges can easily be transferred from the one canal to the other. The locks on the ship canal are not single, but each set of locks has receptacles of different sizes for vessels of different classes, to avoid the waste of water in using a lock much larger than the size of the vessel requires. The canal level descends 16 ft. at the Trafford locks, near Manchester, 14 ft. at the Barton locks, 14 ft. at the Irlam locks, again at Latchford, 16 ft. more, and finally at Eastham, to the level of the sea. The largest lock at Eastham is 600 feet long and 80 feet wide.

The line of the canal is cut through flat country, marsh meadows chiefly, pretty straight beyond the junction of the Irwell and Mersey, avoiding the many windings of those rivers, which are generally turned into a new artificial channel, somewhat to the south of the old left bank of each river. In a few places only, on the Mersey, where the ground is higher, the cuttings are 50 ft. deep, partly through sandstone, which has been utilized for the construction of walls, and here the sides of the canal, being of rock, are made more perpendicular than in the softer ground. The whole quantity of earth and stone to be excavated has been computed at forty-eight millions of cubic yards, which is more than the quantity of excavation required for the Panama ship canal, including the Culebra hill cutting; but the undertaking of M. De Lesseps had other difficulties to contend with, in the dam of the river Chagres. Mr. Walker, the contractor for the Manchester ship canal, set to work as large a number of men, not negroes, but English "navvies," with more numerous and powerful machines, and with about one-tenth the expenditure of money. It is stated that nearly 15,000 hands were at one time employed, with eighty steam excavators of four different kinds, pumping engines, steam cranes, and 150 locomotives, for which 200 miles of railway were laid down to remove the earth.

We give herewith a map of the Manchester canal and illustrations of some of the locks.

As originally designed, the canal was to extend several miles into the Mersey, and it was upon the effect of this extension that Mr. James B. Eads, of St. Louis, gave an opinion which was conclusive to Parliament that the works built as designed would lead to the deterioration of the channel over the bar at Liverpool. His argument on this subject, with the illustrations drawn from maps and notes, some of which were a century old, is one of the best engineering papers extant, and was so conclusive to the minds of the Parliamentary committee that the plan was thrown out immediately. It was for this, on which he spent about three weeks' time, he received probably the largest professional fee ever received by an American engineer, at least, for an equal time spent on any subject, namely, nearly $17,000.



THE MANCHESTER SHIP CANAL—LONGITUDINAL SECTION FROM EASTHAM TO MANCHESTER.

Improved Iron Process.

At the recent meeting of the Iron and Steel Institute, the contribution of Mr. Massenez was in many respects the most valuable. Manganiferous molten pig, poor in sulphur, is added to sulphureted pig iron, poor in manganese; the result being that the metal is desulphurized, and a manganese sulphide slag is formed. The mixer in which the process is carried on is a large vessel, in appearance, to judge by the drawings shown, like a converter. The apparatus in use at Hoerde will hold seventy tons of molten pig, but it has been shown that a vessel of about twice the size would be advisable. Details of the working are given by the author, and will be of great use to steel-makers working with phosphoric pig. In the discussion which followed several speakers bore testimony to the value of the invention, Sir Lowthian Bell intimating that a saving of 2s. 4d. per ton could be made by this method over the process of remelting pig in the cupola—a step which has to be taken when it is desirable to combine the product of different blast furnaces. In the large mixer, metal from two or more furnaces can be brought together.

Explosions of Coal Dust.

Two accidents due to the explosion of coal dust are described in the *Jahresbericht d. k. preuss. Gewerberathe fur* 1888. At the Reichenwald works an explosion of coal dust took place in the dried coal store room while the operations were in full progress, with the result that the front of the drying house was violently blown out and a considerable conflagration occurred in the factory. At Furstenberg on the Oder, where the works are entirely built of stone and iron, a similar explosion occasioned no damage, either to the workmen or to the buildings. The ignition of the coal dust appears to have commenced in the lowest feeding screw belonging to the drying room elevator, and to have spread forward to the store room and backward to the two drying houses. Five explosions followed in quick succession in different parts of the works, the detonation being strongest in the store room, and in a few minutes all the chambers containing dry coal dust were on fire.

These accidents afford further proof of the well-known fact that coal dust is itself a dangerous explosive, the presence of which must be guarded against in factories, mines, etc., by thorough ventilation and other protective measures.

The American Newspaper Annual for 1891.

This splendid volume, issued by N. W. Ayer & Son, Philadelphia, contains a descriptive list of the newspaper press, a gazetteer of the places in which papers are published, and a guide to the intelligent placing of general and special advertising. It contains nearly 1,400 pages, but there is no waste room between its covers, every page has its purpose and is full of solid, useful matter.

The total number of newspapers and periodicals enumerated, located, and described in this edition is 19,011, an increase over last year of 480. The average net growth in legitimate newspapers and magazines for the last three or four years has been from seven to eight hundred; and excepting in a few localities, there has been no great variation from this average this year.

The price of the annual is $5. It represents a vast amount of laborious research, and is of unequaled value to all who are in need of an accurate and reliable compendium of the American press.

Geological Notes—Crystalline Rocks of Missouri.

We have received Bulletin No. 5 of the Geological Survey of Missouri. Besides a paper on the clays and building stones tributary to Kansas City, by G. E. Ladd, resident geologist, it also contains an extremely interesting and valuable paper on "The Age and Origin of the Crystalline Rocks of Missouri," by Erasmus Haworth. The following prefatory remarks to this paper are by Arthur Winslow, State Geologist:

"The crystalline rocks of Missouri occur exclusively in the southeastern portion of the State. They are abundantly exposed in Madison, Iron, and St. Francois Counties; but they are also found, though less frequently, in at least eight other counties of this section of the State. They constitute the mass of the rugged hills and mountains of Iron and Madison Counties, and elsewhere their characteristic occurrence is in similar hills surrounded by limestone valleys. These are truly ancient elevations, older than any others in the State, older than the mountains of Arkansas, older than the Appalachians, older than the Rocky Mountains. If venerable be an attribute of great age, they certainly merit that appellation. And not only are all other rocks of Missouri youthful as compared with these, but there is a genetic relationship, and the former are in a sense descendants of the latter. For, when the limestone and other sedimentary rocks were yet unformed, these crystalline rocks must have existed as parts of a continental mass, and from the degradation of this continent resulted the materials of the later formed sedimentary rocks. The present granite and porphyry hills are but protruding parts of the remnant of this ancient continent which stood as islands above the ocean waters while the beds of limestone and sandstone were being formed around them; which rose with these beds when they were lifted from the waters; which now, rugged and weather-beaten, yet tempered by age and varied experience, rear themselves above the surrounding younger rocks and bid fair still to live when the latter have yielded to the forces of degradation.

"The question of the origin of these rocks has, heretofore, never been made a subject of such exact study as modern methods call for and as its importance justifies. Swallow,* while recognizing the granites and the porphyries as igneous rocks, presents little or no demonstration in support of this view, and, further, he classes, as metamorphosed slates and conglomerates, rocks which the present work shows cannot be separated from the porphyries. Other writers seem to have substantially accepted this conclusion in a large part, but Pumpelly† expands upon it and applies the hypothesis of metamorphosis to all of the Missouri porphyries.

"Mr. Haworth's study of these rocks began in the summer of 1886, and he has ever since pursued the subject with zealous yet patient enthusiasm. This he has done partly at his own instance, partly in the interests of the National or State Geological Surveys, but always without pecuniary gain. Hence this survey, though fortunate in gleaning the results of his years of study, is also under obligations to him for this contribution.

"The association of iron ores with these rocks brings the question of the origin of the latter into direct economic importance; for the distribution of these ores is fundamentally dependent upon this question. Exploration for, or development of, such ore bodies based upon wrong theory must invariably lead to profitless expenditure."

Rare Salts.

At a recent meeting of the Chemical Section of the Franklin Institute, Mr. Waldron Shapleigh exhibited the following specimens of salts of the rare earths:

Praseodymium, neodymium and lanthanum oxides, sulphates, nitrates, chlorides, carbonates, oxalates, acetates and double salts with the alkaline metals.

Cerium oxide, oxalate, chloride, nitrate, and the double nitrate of the cerous and ceric oxides with ammonium.

Yttrium and erbium nitrates, oxides and oxalates.

Zirconium oxide, nitrate, sulphate and some double salts.

Yttrium and erbium (not separated) oxides and nitrates obtained from gadolinite, cerite, monazite, fergusonite and samarskite. Thorium and vanadium salts.

Also large specimens of the following minerals from which these salts were obtained: Samarskite, zircon crystals and monazite sand from North Carolina, monazite sand from Brazil, gadolinite from Texas and allanite from Virginia.

Mr. Shapleigh said the collection was of interest, as it is the first time the salts of praseodymium and neodymium have been shown, and probably separated in this country. Some of the salts have not been heretofore prepared.

The separation of these elements is long and tedious; the specimens shown have undergone nearly 400 fractional crystallizations, and have been in a state of constant preparation since early in 1888. Tons of cerite and monazite sand have been used, and tons of the salts of cerium and lanthanum obtained, but the yield of praseodymium oxide has been only a few kilos. The percentage of neodymium is much higher.

Dr. Carl Auer von Welsbach, in 1885, was the first to separate didymium into these elements, and, together with Professor Bunsen, to determine their atomic weights, that of Pr 143·6 and of Nd 140·8. The oxides are M_2O_3 and probably M_4O_7.

With one exception, the salts of praseodymium exhibited were of a pale green, and of neodymium pink or amethystine color.

Zirconium, lanthanum and cerium should no longer be classed among rare earths, as hundreds of tons of ores from which they are obtained have been located in North Carolina, and there seems no end to the deposits of monazite sand, one of the richest ores, and containing most of the rare earths. In Brazil it does not have to be mined, as it is in the form of river sand. In North Carolina it is found in washing for gold.

Should the arts, trades, or manufactures create a demand for these so-called rare earths, nature could readily supply it from these two localities.

Thorium and yttrium minerals are not so easy to obtain; they have, however, recently been found in quantity in North Carolina and Texas.

Working on a commercial scale, he finds the yield of lanthanum from cerite nearly one per cent higher than stated in the analyses published.

The Loss of Old Age.

The type of essay *De Senectute*, of which Cicero gave us the model, is not much affected now. Perhaps the Roman orator exhausted the sentimental and philosophic side of the subject. At any rate, the view of old age which most interests moderns is not how to enjoy it, but how to get and prolong it. Perhaps this is really the essential thing, since it appears as if, despite sanitation and all our modern improvements in living, old age is gradually slipping away from us.

It is true that we have immensely lessened infant mortality and extended the mean duration of life to over forty-five years. But the average number of old people is not correspondingly increased, and it is even charged that when great old age is now reached, it is abnormal and the evidence of a deep-seated neurosis whose penalties are visited on succeeding generations.

The foregoing statements are not vague generalizations, but based upon carefully collected vital statistics. Sir James Crichton Brown, in a recent address on old age, states that since 1859, in Great Britain, the decline in the death rate has been 17·5 per cent at all ages under fifty-five, and only 2·7 at all ages above fifty-five. Between the years sixty-five and seventy-five there has actually been an increase in the death rate.

The cause of this increment in later death rates is attributed to cancer, heart diseases, nervous diseases, and kidney diseases.

These diseases are mainly of the degenerative class, and due to the wear and tear of modern life. This is shown by the fact that the death rates after forty-five are less among women and less in the country than in the city.

Dr. Brown gives us the further discomforting reflection that men and women are growing old before their time. "Old age," he says, "is encroaching on the strength of manhood, and the infirmities associated with it are stealthily taking possession of the system some years earlier than they were wont to do in former generations. Deaths due simply to old age are now reported between forty-five and fifty-five years of age, and in large numbers between fifty-five and sixty, and there has been a reduction in the age at which atrophy and debility—another name for second childishness—kill those who have passed middle life. Presbyopia, or the long-sightedness of old age, in which near objects cannot be distinctly seen unless held at a considerable distance from the eye, is believed by some experienced ophthalmologists to begin, as a rule, rather earlier than it used to do. No trustworthy statistics on the subject exist, and of course general impressions ought to be received with caution, for it must be difficult to distinguish how far the early recognition of ocular failure in these days is attributable to the increased care bestowed on the eye, and how far it should be ascribed to untimely invasion, but I certainly attach great weight to the opinion of Mr. Critchett, who says, 'My own experience, now extending over a quarter of a century, leads me to think that both men and women now seek aid from glasses at an earlier period of life than their ancestors.' Very significant also is the statement of Mr. Brailey that 'people who have lived long in hot climates like India become presbyopic four or five years earlier than they would otherwise have done,' for life in a hot climate really means excessive wear and tear to a European. The ordinary age for the adoption of spectacles for reading used to be fifty; it is now, I believe, nearer forty-five."

The teeth are dropping out earlier, baldness is more prevalent, senile insanity is more common, and appears sooner than it used to do; suicide is increasing, and most suicides occur between the age of forty-five and sixty-five.

This is rather a doleful outlook, and one naturally seeks to know if Dr. Brown has a remedy for the ills he portrays. "There is," he tells us, "no short cut to longevity. To win it is the work of a lifetime, and the promotion of it is a branch of public medicine. Perhaps one of these days we may have an International Congress on Old Age, with an exhibition of dotards for warning, and of hale and hearty centenarians for encouragement. At any rate you may rest assured that it is by steady obedience to the laws of health that old age may be attained, and by judicious regimen that it may be prolonged."

This is all very true, but, unhappily, it has been well known since the days of Hufeland. Perhaps the best and only thing that we can do is to teach children more earnestly the fact that to enjoy the last half of life they must take care of the first half. The maxim, "*Dum vivimus, vivamus*," is the one which above all makes old age a sickly and unhappy one.—*Med. Record.*

Increasing Locomotive Cylinder Power at Speed.

The Sturtevant Blower Manufacturing Company, of Boston, describes many experiments relating to the resistance to the flow of air through pipes at a high velocity. These experiments show that a single opening of a given area is vastly more effective to conduct steam or air than the same area divided into small separate apertures. It is evident that a long, thin opening will not carry the same amount of steam that a wider and shorter opening will when of the same area; or if two openings have the same area, the one which has the width and length more nearly the same will carry the larger amount of steam in a given time and at a given pressure.

As locomotives are now built, only a fraction of the total weight is utilized at speeds above forty miles per hour. Hence an increased weight is not necessary to pull heavy trains at high speeds after they have attained speed; also there is sufficient steam capacity in the ordinary locomotive to furnish the steam required to do heavy express work. The only means we have, then, of increasing the power of express locomotives at speed is to increase the mean effective pressure in the cylinders. To do this there is no surer way than to increase the outside lap and the travel of the valve; but it must be acknowledged that an increase in the length of the port has some good effect on the admission line, and there is no good reason why the admission should not be made more perfect by the use of the Allen auxiliary port, provided it is made wide enough through the body of the valve.—*Railroad Gazette.*

The Hoop Snake.

The Pittsburg *Leader* reports the following as having taken place at New Castle, Pa., October 21: Hon. Henry Edwards, ex-member of the Legislature, who resides at Moravia, this county, has received a severe shock from fright. C. H. Weekly and L. P. Little were building a fence near Mr. Edwards' home, when they were surprised to see the ex-member of the Legislature run down the road minus hat, coat, and vest, and loudly calling for help. He was pursued by a mammoth hoop snake, which was running, or rather rolling, after him. The reptile had its tail in its mouth, and was rolling along hoop fashion. Little and Weekly succeeded in killing it. The snake measured exactly five feet nine inches in length, but its body was not much thicker than a man's finger. Near the end of the tail was a horn-like affair, which is said to be the reptile's means of defense. This horn was one and one-fourth inches in length, and its sting is certain death. The snake has been preserved in alcohol.

In the SCIENTIFIC AMERICAN for November 30, 1889, we gave an engraving and an interesting description of the hoop or milk snake, by our valued contributor, Dr. Nicolas Pike. It will be seen from the information there given that the alleged rolling of the hoop snake is an optical illusion. The reptile does not roll and does not take its tail in its mouth. It progresses by loop movements, somewhat like the measuring worm. The snake gathers itself up into large loops, and pushes itself forward, all with such amazing rapidity as to appear, to a frightened beholder, as if it actually rolled. The mind of man is very easily deceived by false impressions made through the eye. There are other reptiles besides the milk snake that progress by the loop movement, for instance, the bull or pine snake, and also the queen snake.

A Useful Plaster.

A plaster composed of one part of carbonate of lead in two parts of olive oil is considered in Holland to be an efficacious remedy for sprained joints. Dr. Duhamel has been trying its effect in Paris on a number of cases, most of which were sprains of the ankle, and it is said the patients were made to walk as soon as the plaster and retaining dressings had been applied.

*Second Annual Report. By G. C. Swallow, State Geologist, 1854, pp. 133 to 135.

†Report on the Iron Ores and Coal Fields of Missouri. By Raphael Pumpelly, State Geologist, 1873; pp. 3 to 28.

RECENTLY PATENTED INVENTIONS.

Railway Appliances.

CAR DOOR.—John W. Crumbaugh and Leander C. Prater, Kansas City, Mo. This invention covers an improvement on doors for cattle cars formerly patented by the same inventors, and consists in peculiar means for adjusting and operating the doors in connection with the bridge. The door is made in two sections hinged together, and a set of crank shafts connects one of the sections to the car for a radially swinging parallel motion, the doors when opened only swinging one-fourth of the door opening or one-half the width of each double car, while the swinging sections may be raised over a platform. There are no sliding connections at top or bottom, and no danger of obstructions by mud or straw from the car door, while the action of the bridge is free in its adjustment, and cannot be obstructed by rubbish or freezing.

RAIL SUPPORT.—Charles M. Dyer, Cloverdale, Ind. According to this invention a screw rod is formed with a clamp engaging the base of the rail, a nut engaging the screw rod, and a tie plate formed with a casing in which the nut is mounted to turn, the whole forming a rail support which is simple and durable in construction and permits of conveniently and quickly raising or lowering the rail to keep the track in proper alignment without distributing the road bed or ties.

TO TURN NUTS ON FISH PLATES.—Raymond Allen and Hugh Ross, Revelstoke, British Columbia, Canada. A machine for applying nuts in operations on track irons is provided by this invention, the machine being designed to be quickly and securely clamped to a rail joint, and used to simultaneously tighten or loosen all the nuts of a joint. The machine comprises a frame with adjustable jaws to be clamped to the track by a lever mechanism, the outer jaws being connected by a cross bar having sockets, while a series of transverse shafts are mounted in the frame and provided with sockets at their inner ends, the shafts being turned by a gear mechanism. The machine is as well adapted to the lifting as to the laying down of track, all the nuts of a joint being operated on at once.

ELECTRIC BLOCK SIGNAL SYSTEM.—John La Bart, New York City. A movable contact block is arranged adjacent to the track rails, a swinging lever in the path of the block being connected with a semaphore, which is brought to a locked position, to be released by a suitable electric connection, while the locomotive has contact brushes forming terminals of a circuit with intermittent contacts along the track, in connection with a lever mechanism controlling the steam supply, with other novel features. By this system the signals are designed to be automatically operated by the moving train, being first set to indicate danger and afterward set for safety, while in case the engineer does not see the danger signal, and runs over it, the steam is designed to be automatically shut off to stop the train.

Mechanical Appliances.

LOOM HARNESS.—William A. Grant, Paterson, N. J. This invention relates more particularly to a loom employed in the finer grades of fancy weaving, providing therefor a simple harness that will relieve the irregular tension placed on the warp threads by the harness now used. The invention provides a double scale harness, by the arrangement of two shafts either in front or rear of the jacquard or figure harness, the two shafts working solely the ground for the fabric, and when the design is to appear, the jacquard lifts the coupling and the pair of threads therein are raised, the threads being connected with the eyes of the two different independent heddles. The improvement is designed to be adaptable to many varieties of weaving, involving less than the usual wear and tear of the parts and facilitating the making of more perfect goods, as there will not be so many stops of the loom to pick up ends.

PIPE WRENCH.—John Ryan, New York City. This wrench is made in four pieces, a body bar with attached handle and guide strap, an adjusting bar carrying the upper jaw, an adjusting nut traveling on the toothed surface of the adjusting bar and fitting within a recess in the body bar, and a laterally movable spring-controlled lower jaw supported by the body bar. The wrench is simple in construction, and is designed to be durable and economic, the various parts being readily separated and any one part duplicated if necessary.

Agricultural.

HAY RAKE.—Nathan H. Miller, Rushville, Ohio. This rake is designed to be operated by a driver seated on an animal pulling the rake over the field, or the rake may be actuated by the operator following in the rear, the windrow being formed on the pulling of a lever, and the rake automatically returning to a gathering position. The invention relates to that class of rakes whose toothed heads revolve in forwardly extended arms to which the draught animal is attached, the improvement covering improved means for rotating the toothed head or rake shaft. This rake is designed to be simple and durable in construction, containing but few parts, which are not liable to get out of order, and in case of injury can be readily replaced.

Miscellaneous.

GUNBOAT TURRET.—William H. Avey, Columbus, Ky. In this turret the common platform is adapted for vertical adjustment, and is held to revolve with the turret or shield proper. The upper part of the turret is made tapering, and it is held to rotate with a central shaft extending down into the lowermost compartment, and driven by suitable power. The common supporting floor fits inside the turret, with the body of which it may be connected for both to rotate together. In operation, when the floor is lowered the cannon is first drawn inward, and can be sighted if desired, and it and the floor raised to the desired height, when the cannon will be moved so that its small end will project through a port hole in the turret and close it.

FENDER FOR VESSELS.—Jacobus T. C. Koch, Amsterdam, Holland. This invention provides different forms of improved fenders for the bows and sides of vessels, by means of which the injurious effects of collisions may be materially lessened. These fenders have the common feature of being elastic, and also have a rigid frame to which the elastic cushion is secured, whereby body is given to the latter, and the effect of a blow will be distributed over a large surface. The fenders are secured in place on the vessel by guys and suspension ropes.

SALT PAN.—Alvin T. Dora, Hutchinson, Kansas. This is an improved device for evaporating salt brine, the pan having a flat bottom with inclined sides at one end and the remaining portion of the bottom being formed into a series of troughs, in the bottoms of which screw conveyers are operated to carry the salt to the flat portion of the bottom of the pan, from whence it is carried by a belt provided with scrapers and delivered to a conveyer which carries it to the packing room. By this construction the salt is being constantly raked from the bottom of the pan, which is provided with a large heating surface, while the brine is so continuously stirred that the accumulation of salt and the formation of scales on the pan bottom are prevented.

FLOAT GOLD COLLECTOR.—Robert Elliott, Paulina, Iowa. This is an apparatus for collecting and saving float gold in rivers or streams, for which purpose posts are set on opposite sides of the stream to carry guide rods on which slide other rods provided with hooks, to which by means of links is attached a sieve formed of bolting cloth or other suitable material, the sieve extending transversely across the stream, and being retained in position by weights. The sides of the sieve are adjusted vertically on rods as desired, and the sieve can be readily hauled in, in the form of a bag, to be unhooked, and the collected gold washed out.

CHALK LINE HOLDER AND PLUMMET.—Robert C. Huxtable, Dartmouth, N. S., Canada. The body of this device is of rubber or other flexible material, with spiral grooves around it on which the line may be wound, the line passing through the body by eyeleted holes in each end, while the central space of the body is mainly filled with chalk. The device is of convenient shape to be held in the hand, and one end is weighted. When used for making a chalk line, the line is first drawn through the device, to be properly chalked, and is then used in the ordinary way, but when used for a plummet the body is moved to one end of the line, and then forms the weight of the plummet as it is held suspended by the line.

FENCE CLAMP.—Hugo Loether, Fredonia, Kansas. This is a device especially adapted for use in constructing picket fences where the pickets are to be held in position by wire, the clamp consisting in a shank with two claws at each end, bent oppositely outward and then curved inward, with their ends far enough apart to admit the wires. The length of the clamps determines the distance apart of the pickets, the device acting in the double capacity of a clamp and a gauge. By this means a fence may be quickly and economically put up by an inexperienced person, and a fence machine is not required.

HOSE AND OTHER COUPLING.—Isaac St. Clair Goldman, Los Angeles, Cal. This coupling comprises a female section having a semicircular recess in its end and provided with a lip, a male section having a semicircular head fitting in the recessed section, with a washer to form a tight joint, and provided with a rigid hook engaging the lip of the female section, with means for locking the two sections together. The device is of simple and durable construction, can be quickly applied to securely fasten the parts in place, and is designed for use on hose, rods, etc.

WASHING MACHINE.—Henry Church, Parkston, South Dakota. This invention provides a cylindrical clothes holding and washing chamber, composed of two hinged sections, mounted to be revolved in a suds box. The sections of the clothes cylinder are secured together by a peculiar form of safety latch, and secured to the head walls of the cylinder are spaced slats, with wider slats having diagonal ribs, and within the two sections are pairs of cleats forming abutments on which the clothes will rub as the cylinder is turned. The machine is designed to be simple, compact, and thoroughly efficient, having novel features to expedite the operation of washing.

MAP OR CHART STAND.—Henry E. Hayes, Brooklyn, N. Y. This is an adjustable stand in which a vertical rod is supported in the socket of a block held on a low wire tripod, there being on the rod an adjustable sleeve having inclined socket projections adapted to receive outwardly projecting rods or arms. Clamping bars, in which may be placed charts or maps, are supported by these projecting arms, and the maps or charts may be readily raised or lowered by the adjustment of the sleeve on the vertical rod. The device is made in several parts, which can be readily set up or taken apart to be packed in small space.

GLOVE.—William J. Fanshawe, Brooklyn, N. Y. This glove has eyeletted apertures in its palm portion, and is provided with a chain or cord leading outward therefrom and carrying an attaching device for connection with a pocket book, purse, or the like, whereby the purse may be securely held and locked in the gloved hand, while allowing of convenient access to it.

DRAWER PULL.—James Preston, New York City. This invention relates to cabinet hardware, the invention providing a simple, cheap and durable post for handles, consisting of a wire threaded at its inner end and bent at its outer end to form an eye and a stop, a sleeve being cast on the post adjacent to the eye. Posts thus made are inexpensive, and being formed of wrought metal, are stronger and more durable than the ordinary cast posts.

VEGETABLE CUTTER AND SLICER.—Mathias Blumer, Shelby, Wis. The body of this machine consists of a circular casing having an open bottom and partially closed top, secured on standards projecting upward from a base frame. It has horizontal knives which may be adjusted to cut either a thick or thin slice, and vertical knives which may be removed if desired, the machine being operated by a crank, and being adapted to either slice or mince vegetables or fruit in a convenient and expeditious manner.

LAMP CHIMNEY ATTACHMENT.—Mary S. French, Monmouth, Ill. This device consists of a strip of spring metal bent upon itself to an essentially pear shape, the lower extremities of the side members being covered on their outer faces and provided with downwardly extending hooks near their centers. The device is capable of being clamped to and supported on the top of a lamp chimney, being especially adapted for maintaining a curling iron or its equivalent in an upright position within the lamp chimney over the flame of the lamp, and out of engagement with the flame or with the chimney.

TONIC REMEDY.—Charles Schmidt, and Aline R. Ledet, Birmingham, Ala. This is a tonic designed for use in dyspepsia, or debility of the stomach and loss of appetite, also for regulating the action of the bowels. It is composed of cinchona bark, wild cherry bark, mammee nut shells or fruit, rhubarb, oxide of iron, sherry wine, and other ingredients, in certain proportions, and prepared in the manner described.

WATER CLOSET, ETC.—Anne G. Chadbourne, Roxbury, Mass. This invention provides an improvement applicable to water closets, commodes, and earth closets, and relates especially to the seat portion thereof. The improvement consists in a novel construction of both the bowl and seat, designed to promote cleanliness without the necessity of constant care.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention and date of this paper.

NEW BOOKS AND PUBLICATIONS.

DIE ELEKTRISCHE KRAFTUBERTRAGUNG UND IHRE AMVENDUNG IN DER PRAXIS. By Eduard Japing and J. Zacharias. 61 illustrations. Third Edition. Vienna: A. Hartleben's Verlag.

The third edition of "Electrical Power Transmission "is completely changed from the first two editions, owing to the tremendous progress made in the last few years relative to such transmission. The introductory chapter treats on transmission and power in general. A chapter is devoted to "generating the electric current;" the main portion of the book, however, treats on Transforming the Electric Current into Power. The book is admirably written and refers to the latest improvements and experiments, giving full data as to results, costs, etc.

A HANDBOOK OF INDUSTRIAL ORGANIC CHEMISTRY. By Samuel P. Sadtler, Ph.D. Philadelphia: J. B. Lippincott Co. 1891. Pp. 519. Price $5.

The application of chemistry to the arts and manufactures is the subject treated by Dr. Sadtler. He divides his work into chapters treating of Petroleum and Mineral Oil Industry, Fats and Fatty Oils, Essential Oils and Resins, Cane Sugar, Starch, Fermentation Industries, Milk Industries, Textile Fibers, Animal Tissues, Destructive Distillation, Artificial Coloring Matter, Natural Dye Colors, and Bleaching, Dyeing and Textile Printing. This extensive range of topics is treated quite at length with numerous illustrations. The standpoint taken is not exclusively the preparation and manufacture, but includes the analysis of the products, microscopic characteristics, etc. The work will, we believe, be found to fill a real place in technical literature. Each chapter has a bibliographical index, increasing greatly the value and use of the work.

CHEMISTRY OF THE CARBON COMPOUNDS OR ORGANIC CHEMISTRY. By Professor Victor von Richter. Authorized translation by Edgar F. Smith. Philadelphia: P. Blakiston, Son & Co. 1891. Pp. 1040. Price (cloth) $3.

It is not too much to say that a real want is at last filled by the production of this manual. The entire field of organic chemistry is comprised in its scope, and is treated in considerable fullness. The great advantage of having the full matter contained in a single volume with a single index is obvious, and is doubly acceptable to those who have had to consult some recent multiple-indexed chemistries, bound up in separate volumes and separate parts besides. On glancing over its pages one excellent system appears, that of giving the preparation of compounds. It will be noticed that the title page gives a definition of organic chemistry, something long wanted, and we fear still wanting, even in the light of the name in question.

DYNAMO CONSTRUCTION. By John W. Urquhart. New York: D. Van Nostrand Co. 1891. Pp. xvi, 353. Price $3.

The subjects treated in this work embrace framework construction, field magnet and armature grouping and compounding, the magnetic circuit and elements of dynamo calculation. Numerous illustrations are employed to elucidate the text. The practical aspect of the subject is preserved by the production of examples of leading commercial dynamos and motors of different different countries. The introduction, giving the history of the invention and development of the modern dynamo, is especially interesting.

AN INTRODUCTION TO THE MATHEMATICAL THEORY OF ELECTRICITY AND MAGNETISM. By W. T. Eintage, M.A. Oxford: Clarendon Press. 1891. Macmillan & Co., New York, Publishers. Pp. viii, 238. Price $1.90.

The title of this book must serve as its review, as owing to its nature it cannot be adequately treated in these columns. The work is comprised in three parts, the first treating of electrostatic electricity, the second of magnetism, and the third of dynamic electricity, electro-magnetic measurements, etc. While mathematical in its basis, the reading text is amplified so that formulas and abstract statements form really a small proportion of the contents. It is well worthy commendation to our readers.

PROGRESSIVE EXAMINATION OF LOCOMOTIVE ENGINEERS AND FIREMEN. By John A. Hill. New York: John A. Hill, Publisher. 1891. Pp. 97. Price 50 cents.

Mr. Hill is a member of the Brotherhood of Locomotive Engineers, etc., and writes this work from the plane of a graduate of the footboard. It is excellently written. The plan followed is to give several examinations in question and answer from four different degrees of progress, following each by a short lecture on the ethics as well as practice of the engine runner's work. It is all so well and graphically put as to form good reading for those who never expect to set foot on an engine, and is not the only instance we could cite of good writing by a locomotive engineer.

THE NATURE AND SOURCE OF ELECTRICITY, AND ITS APPLICATION TO THE ELECTRO-PLATING PROCESS. By Scott A. Smith. Providence, R. I. Pp. 35.

This attractively printed and prettily bound book is issued by the Gorham Manufacturing Co., and is a convenient little manual on the titular subject.

DIE BADE-ANSTALT. By J. H. Klinger. 47 illustrations. Vienna: A. Hartleben, Publisher.

The book is intended for architects, builders, etc., to assist in the proper construction of public bathing establishments for cities.

ELEKTRO-METALLURGIE. Die Gewinnung der Metalle unter Vermittlung des elektrischen Stromes. By Dr. W. Borchers. With 19 illustrations. Harold Bruhn, Brunswick. 1891.

In this book Dr. Borchers admirably treats the several processes for reducing metals by means of the electric current. The first part is devoted to the lighter metals, such as alkali metals, alkaline earth metals, magnesium, barium, calcium, strontium, and metallic earths. The second part treats on the heavy metals, including zinc, nickel, cobalt, copper, lead, silver, gold, antimony and platinum.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in the following week's issue.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(3601) M. S. writes: 1. I wish to run a 4or 6 candle incandescent lamp for from five minutes to half an hour at a time, lamp to be 40 feet from battery. I have four 5×6 cells, each containing two carbons 6×1½×¼ inch and porous cup 6×2¾ in which is placed an amalgamated zinc rod in a little mercury. Solution of chromic acid to be used outside porous cup, acidulated water inside. How many such cells are needed to light the lamp properly? A. From 6 to 8 cells. 2. Can I use any more effective cell than this? A. We think not. 3. Is the zinc in this battery consumed while the circuit is open, or is there any local action when the battery is not in use? A. The action in the Fuller battery is very slight when the circuit is open. 4. How long will this battery light the lamp continuously, and what proportions of chromic and sulphuric acids with water are most effective? A. The battery will probably operate continuously for a week. It will require about 10 per cent each of the chromic and sulphuric acids. 5. What size wire is best to connect lamp with battery? A. Use No. 16. 6. Can I use the same battery to light a gas jet without the help of a coil? If not, how small a coil can I use and light a jet 50 to 75 feet from battery? What size wire and how much by weight shall I use to make the coil, and how much and what size iron wire will I need for the core? A. A coil will be needed to light the gas. Make a spark coil by winding on a ¾ inch bundle of soft iron wires, 8 inches long, 10 or 12 layers of No. 18 wire. Use No. 16 iron wire for the core. 7. Would the battery be too powerful for a bell at 75 feet? If so, couldn't I use German silver wire in the circuit to the bell? If the idea is practical, how much and what size should I use? A. You can use a bell having a suitably wound magnet without employing German silver wire.

(3602) E. N. A.—1. For a full description of luminous paints we refer you to our SUPPLEMENT, Nos. 229, 249, 497, and 599. 2. For parlor matches.—Dry the splints and immerse the ends in melted stearine. Then dip in following mixture and dry:

Phosphorus (red)	3 parts.
Gum arabic or tragacanth	0·5 "
Water	3 "
Sand (finely ground)	2 "
Binoxide of lead	2 "

Perfume by dipping in a solution of benzoic acid. 3. With a power blast you can melt iron or brass, but the operation can only be carried on in a small way. 4. We can supply Root's "A. B. C. of Bee Culture" for $1.25, Cook's "Manual of the Apiary" for $1.50, Langstroth on the "Honey Bee," $2.

(3603) H. W. S. writes: In paper of October 10, 1891, in Notes and Queries column, No. 3446, W. E. V. asks how to straighten lance wood which is bent or crooked. Heat it in gas flame or otherwise, until about too hot to handle comfortably; then it will be soft and pliable, something like lead, and will stay put. I have done it so.

(3604) A. C. asks if it would be dangerous to connect the exhaust pipe of a gas motor with the sewer. A. Yes, it would be dangerous, as gas sometimes passes through into the sewer and causes explosion. Connection with chimney also results sometimes in explosions.

(3605) G. W. S. writes: 1. I wish to make an induction coil like that described in "Experimental Science." Would it not be better to use insulated wire for the secondary coil instead of the bare wire as given? A. You could use cotton-covered wire for the secondary instead of bare wire. It is easier wound, although it is a little more expensive. 2. How much double cotton-covered wire should be wound on the secondary coil to make the machine as effective as possible? A. Use about one-third more wire than the amount mentioned in the article referred to. 3. Why is it necessary to leave a space of one-eighth inch near the heads, and would it still be required if insulated wire was used? A. The space near the heads is left to avoid the possibility of the bare wire slipping down between the heads and the paper used to separate the coils. 4. In figuring the tin foil surface, are both sides considered? A. Yes.

(3606) H. W. L. asks the best way to protect nickel plating on a bicycle, put away for the winter, from rusting. Are the preparations like anti-rust, etc., good for this purpose without tarnishing the surface after removal in the spring? By answering you will have the gratitude of all wheelmen, as this question now presents itself to them. A. In putting away a bicycle for the winter, every part should be thoroughly cleaned from dirt, the running parts duly oiled and the bright parts wiped with a mixture of vaseline and paraffine, 2 parts vaseline, ½ part paraffine, to which add a half part of finely ground quicklime by heating and stirring. Apply warm by wiping all the nickel parts, and wrapping them in paper which has been coated on one side by the mixture, very thin, which will keep off dust and dampness. The japanned parts and saddle should also be nicely covered with wrapping paper to keep off dust, which injures the japan by long contact.

(3607) W. V. L. asks (1) how to make type metal or the composition of same. A. Type metal consists of lead 3 parts, antimony 1 part, melted together. You can readily procure old type from any printer at a low price, thus saving the trouble of making the alloy. 2. If it is advisable to use the same for making the cylinder or drum on the phonograph described in SUPPLEMENT, No. 133, in place of the plaster one? A. Type metal will do very well for the phonograph cylinder referred to. 3. How many 6 by 8 cells of gravity battery are required to run the Gramme motor described in SCIENTIFIC AMERICAN, No. 783? Or please recommend some cheap battery to run the above motor for about 10 hours continually. A. The gravity battery is not adapted to running the motor. Use 6 or 8 cells of large plunging or bichromate battery.

(3608) G. A. H. asks: 1. Would you kindly inform me the best style of galvanometer to use for field work in the open air with rough usage for measuring small currents accurately? A. We think a Thompson marine galvanometer would answer your purpose. 2. Can the resistance of the earth to the passage of small currents be measured the same as a wire conductor, as for instance the return circuit of a telegraph line using the earth as a return? A. You can measure the resistance of the earth by establishing a circuit with the earth as return, afterward deducting the resistance of the metallic conductor used. 3. Would there be any measurable difference between say 100 feet and 200 feet distance of such return? A. With proper ground connections we think the resistance will be found to be practically nothing. 4. Suppose a current to be generated in the earth by an underground stream of water flowing swiftly, would such a current be continuous or alternating? A. It will undoubtedly be continuous. 5. Is it necessary in order to transform a current to a higher or lower potential that it be an alternating current instead of a continuous current? A. Yes, unless it is done by means of a motor dynamo, that is to say, the primary current being used to drive the motor, the secondary current being taken from the dynamo.

(3609) F. A. M. asks how to clean sea and similar shells and make them look nice. A. Dark colored organic matter on the outer surface is first removed by making a thick mixture of one part bleaching powder to two parts water and soaking the shel therein. On removing wash and scrub it. Thick incrustations of lime must be picked off with a sharp edged hammer or some similar tool, and then the shell must be dipped in boiling dilute muriatic acid. For strong heavy shells use 1 acid to 3 of water; for delicate shells use 1 part acid to 10 of water. Dip the shell for a second only, wash and examine; if not enough, give it a second dip. Hold it in wooden forceps or attach it to a stick in any way to serve as its handle. The important point is not to let the acid stay long on the shell. For local spots it may be applied with a brush.

(3610) J. H. D. asks what will make a paste to hold gold braid to silk ribbon. A. The following, one of the most economical, convenient, and extensively used cements for cloth, is the gutta percha tissue cement. It consists of a thin leaf or sheet of gutta percha, which may be purchased at small cost of any dealer in tailors' supplies. When two pieces of cloth are to be joined, the gutta percha tissue is placed between the parts and a hot flat iron is then applied to the exterior of the cloth. The heat melts the gutta percha and the weight of the iron presses the parts together. On cooling, the cloths will be found strongly cemented together. For attaching together edge linings, fillings and all kinds of parts, this method is excellent. For covering, joining and patching of garments it is unequaled. It saves the drudgery of sewing, and in the matter of mending often enables the housewife to accomplish in a superior manner, in five minutes, work that would require as many hours by the needle.

(3611) C. T. H. writes: I am using a one-sixth horse power Edison slow-speed, series-wound motor to run my polishing and turning lathe. The lathe sits on a table; the motor is in a compartment underneath; the speed is one right for polishing, but very much too high for turning. I have a resistance in the circuit, but it only cuts down the power, reducing the speed very little. I have thought of a brake, also of countershafting, but am unable to plan anything to suit the case. Can you kindly help me out of my difficulty, so that I can run my lathe fast or slow at pleasure? A. We think your best way of regulating the motor is by means of a countershaft and cone pulleys, or by means of plain cones and a shifting belt.

(3612) J. B. R. asks what size to make a balloon that would lift about three hundred pounds. A. It depends on the material and equipment. Make it of 40,000 to 60,000 cubic feet capacity. 2. How many cubic feet of gas a cylinder ten feet long and four feet in diameter will contain. A. 125·6 cubic feet.

(3613) P. C. E. asks the elements and solution which when used as an ink will disappear after a certain length of time (about a day). A. Use dilute tincture of iodine. 2. Also an invisible ink which will appear when warmed. A. Solution of chloride of cobalt, dilute sulphuric acid, lemon or onion juice, and many other substances. 3. A way of making letters on a coin by means of an acid. A. Coat with wax, cut the letters through the wax so as to expose the metal and drop on nitric acid. This will act on all ordinary coins except gold ones. For the latter mix three parts hydrochloric with one part nitric acid. 4. Describe the contents of the long cylinder on the platform of an electric car. A. We presume you allude to the resistance box, for controlling the power of the motor, which box contains heavy resistance coils.

(3614) J. A. asks: 1. How can poison be detected in mushrooms? A. There is no way of doing this. Actual trial or identification of the species is the only certain way. 2. How is a cylinder on an Edison phonograph constructed? Does sound register on a cylinder of wax the same as on tinfoil? A. For construction of the Edison phonograph we refer you to our SUPPLEMENT, Nos. 632 and 706. The composition cylinder is indented like the tinfoil on the original instrument. One cylinder can repeat a tune or words a great number of times.

(3615) B. F. W. asks: How much does iron shrink to the foot? Does the size change the amount of shrinkage? That is, will a 2 inch round bar shrink more or less than an inch round bar? What per cent does iron waste or lose in working? What amount of carbon does machine steel contain? What book would you recommend to read on this subject? A. Iron castings shrink about ⅛ inch to 1 foot, which is the usual allowance for plain work. Cylinders, from one-tenth to one-twelfth inch to 1 foot, according to size. There is very little difference in the shrinkage of a 1 inch and 2 inch bar. The wastage in foundry work is from 2 to 5 per cent. Machinery steel contains from ½ to 1 per cent carbon. See our book catalogue for books on these subjects.

(3616) L. C. M. says: 1. Will you please inform a much interested reader of your valuable paper (through its columns or otherwise) what quantity of water will flow through 3,000 feet of one inch pipe, with a 6 foot head, there being no sharp curve or angle in the line? Also, how is an electric wire insulated where it passes to the interior of a gas engine? A. Your 1 inch pipe 3,000 feet long with 6 feet head will deliver 1·6 gallons per minute. Electric wires for gas engines may be insulated by inclosing in porcelain or glass thimbles to be held in place by a stuffing box packed with asbestos. 2. A Chinaman says: In China, when a man of high degree dies, his body is embalmed by packing it in tea, after which the tea is again boxed and a private mark placed upon the box, and by this mark Chinamen understand that the tea has been used for embalming the dead and that it is only fit for export. Is there any means of substantiating such testimony? A. Shall be glad to hear testimony as to the Chinese custom.

(3617) D. D. W. asks for a receipt for making cotton, etc., waterproof, by putting it in a solution of alum and lead acetate. A. Dissolve 2½ pounds alum in 10 gallons of water and 2¼ pounds lead in 10 gallons of water. Heat may be applied to accelerate the solution; mix the two solutions and soak the cloth therein; or first soak the goods in one, and then in the other. In the latter process use half the quantity of lead acetate and immerse in the alum first, wringing out before putting it into the lead solution.

(3618) C. M. E.—1. The mould on the leaves sent is mycelium of a fungus belonging to the order Perisporiacei. We have seen recommended the spraying of the leaves with a solution of sulphate of copper to destroy the fungus. 2. Dust your rose bushes with insect powder (*Pyrethrum*).

(3619) S. J. S. writes: I wish to connect a bell with my telephone so as to get the calls in another room. Have made a relay that works perfectly with one Leclanche cell, but when introduced into the circuit of the telephone it shows no sign of magnetism. Have tried winding with 22 and 16 wire. Connections are good and no current can get to the telephone without passing through the relay. Is not a telephone current strong enough, or can you suggest the reason for its not working? A. You should use a polarized relay, or insert a magneto bell. The alternating current of the telephone call does not work well with an ordinary relay.

(3620) H. T. C. asks: 1. In a medium sized induction coil, what should be the ratio between the sizes of the wires in the primary and secondary coils, and what kind of a core should it have? A. The ratio of the primary and secondary in an induction coil depends upon the kind of current you desire to have. For the construction of coils we refer you to our SUPPLEMENT, Nos. 160 and 509. 2. It is stated in an elementary chemistry that if a current of oxygen be passed through a solution of ammonia gas, NH_3, the resulting mixture will burn. Please give the chemical reaction. A. The idea is that enough ammoniacal ($N H_3$) vapor will be carried off to make a combustible mixture, the hydrogen burning to water and the nitrogen going off free, thus: $2 NH_3 + 3O = 3H_2O + 2N$. 3. Is there any paint insoluble in alcohol? If so, what kind? A. The majority of paints are insoluble in alcohol. Such as are made with a shellac vehicle are attacked by it. Common white lead with linseed oil is insoluble in alcohol.

(3621) S. A. D. asks if there is any acid that will act on lead or stereotype, and which will not touch beeswax. A. Nitric acid and water equal parts readily attacks lead. Nitric and hydrochloric acids equal parts diluted with an equal part of water attacks stereotype metal. Beeswax, paraffine or asphalt is a protection against these acids.

(3622) T. L. asks for any substance that will remove the sheet gutta percha from cloth without disfiguring the colors. A. Sponge with bisulphide of carbon or chloroform. The danger will be that the gutta percha will, as it dissolves, be soaked up by the cloth and produce a spot. Never use bisulphide of carbon near a light, as it is highly inflammable. Its odor is also very objectionable.

(3623) L. R. C. writes: I have a large carbon battery plate (6×10) which is broken; can you tell me a method by which the pieces may be united, and used in a bichromate plunge battery? A. You can repair your broken carbon plate by using a cement made of flour and molasses. After the cement is applied, the parts should be clamped together and the whole should be subjected to a red heat, the carbon being embedded in powdered carbon in an air tight box. We think you will find it less expensive to purchase a new plate than to repair the old one.

(3624) F. W. B.—The powder sent is potassium nitrate. Mixed with sulphuric acid for a depolarizer in a battery, it has the disadvantage of giving off fumes. We can supply Carhart on "Primary Batteries" for $1.50.

(3625) G. I. H. asks if there is a rule for finding the radius of a circle when the arc and its chord, with distance (at greatest width) from arc to chord (versed sine), are given. A. The square of the chord of half the arc is found by the rule of the "square of the hypoteneuse," by adding the squares of the versed sine and of half the chord together. The radius is equal to the square of the chord of half the arc divided by twice the versed sine.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

October 27, 1891,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Adjustable chair, O. C. White	461,928
Air brake, Barnes & Marshall	462,195
Air moistening apparatus, A. Schmid	462,102
Ash arrester, P. Schickler	462,067
Auger bit, E. Ford	461,897
Automatic gate, P. M. Fudge	462,047
Automatic regulator, B. A. Hawkins	462,055
Automatic ventilator and foul air exhauster, J. H. Hunt	461,873
Axle and bearing, car, J. T. Fanning	462,037
Axle, wagon, D. R. Van Allen	462,181
Baby jumper, G. W. Thomas	462,178
Bag fastener, E. Reist	461,848
Ball bending machine, E. W. Spear	461,877
Baking powder, packing, W. P. Clotworthy	462,109, 462,200
Basin and overflow pipe therefor, H. F. Stowell	461,934
Bath tubs, ornamental casing for, O. F. Grant	462,124
Battery. See Galvanic battery. Secondary battery.	
Belt, bodice, G. E. Zeitmacher	462,068
Bicycle support, J. E. Anderson	461,806
Binding, book, L. Bailey	462,077
Bit. See Auger bit.	
Blind fastening, O. Adams	462,187
Block shaping machine, E. J. F. Coleman	461,860
Board. See Stove board.	
Boat. See Life boat.	
Boiler feeder, J. Austin	461,949
Bolt extracting device, W. W. Johnson	461,939
Bolting machine, S. A. Nordyke	461,845
Book, check, R. W. Morgan	461,907
Boot, M. Neuburger	461,901
Bottle, drenching, R. Mantey	462,056
Bottle stopper, J. H. Lackey	461,941
Box. See Letter box.	
Brake. See Air brake. Car brake. Railway brake.	
Brick drying apparatus, Turley & Beverly	462,179
Brick kiln, J. Dunnachie	462,036
Brick kiln, W. L. Gregg	462,215
Brick, manufacture of enameled, W. A. Mikach	461,980
Bridge gate, automatic draw, W. F. Miller	462,012
Brush, rotary, C. Pederson	462,156
Buggy gear, D. G. Wyeth	461,971
Burette clamp, W. H. Chaddock	462,032
Burner. See Gas burner. Vapor burner.	
Butter worker, E. J. Fargo	461,836
Button clasp, Lamboley & Jacobson	462,143
Button fastener, R. H. Wheeler	462,023
Button flies, machine for cutting, P. B. Clark	462,201
Cable conduit covering, H. Hughes	462,146
Camera. See Photographic camera.	
Candle, sulphur, Moss & Bourne	462,085
Cane mill housing, G. Simon	462,169
Canopy frame, J. C. Goss	462,077
Car brake, electric, L. C. Atwood	461,808
Car coupling, T. Coursar	462,114
Car coupling, J. B. Granger	462,076
Car coupling, A. G. Leonard	461,839
Car coupling, S. J. Moseker	461,908
Car, railway, C. N. Cooke	461,816
Car, railway hand, J. H. Baker	462,150
Car replacer, J. McQuillan	462,152
Car, vestibule, S. W. Tanner	461,927
Car wheel, J. A. Webber	461,959
Cars or other vehicles, means for supplying motive power to, L. O. Dion	461,895
Cars, trolley for electric, C. A. Lieb	461,940
Card flat, J. A. Foss	462,121
Cards, machine for treating, C. A. Wright	461,960
Cards or similar articles, machine for applying metallic leaf to, C. A. Wright	461,861
Carpet sweeper, C. A. Hammett	461,831
Carving machine, W. Loeffler	462,096
Case. See Display case.	
Cash indicator and register, H. C. Stilwell	462,106
Cash register and indicator, H. C. Stilwell	462,104, 462,105
Casting steel wheels, W. G. Richards	461,962
Chair. See Adjustable chair.	
Chair, J. C. Hurd	462,040

Channel securing device, A. Dillon 461,935
Chimney top, F. Rasner 462,162
Chopper. See Cotton chopper.
Chuck, universal automatic, W. H. Gates 461,870
Churn, H. T. Henderson 461,885
Churn, A. Spies 461,933
Churn cover, M. L. Hoyt 462,097
Cigar bundle wrapper, A. & J. Michalitschke 462,098
Cigar cutter, J. H. Bowen 462,074
Cigar fillers, method of and machine for making, B. Baron (r) 11,109
Cigar moistening device, H. Hogendobler 461,872
Circuit controller, W. B. Cleveland 462,083
Clasp knife, R. C. Kruschke 462,141
Clock, S. Feilinger 462,089
Clock, four-hundred-day, A. M. Lane 462,019
Clock key, A. M. Lane 462,011
Clocks, power equalizing apparatus for, J. A. Olmsted 462,017
Closet. See Water closet.
Clothes rack, O. C. Sobolewski 461,954
Clutch, friction, H. C. Crowell 461,929
Coal bunkers, cover for, W. W. Reynolds 462,163
Coal drill, W. Bullock 462,139
Coin holder, F. Miehl 461,720
Comb and the manufacture thereof, H. G. Guild 461,977
Concrete block and making the same, G. Richardson 461,930
Concrete mixtures, machine for solidifying, G. Richardson 461,889
Cooking apparatus, Sea. W. H. Simonds 461,989
Corn sheller, F. H. Barnett 462,108
Corner shield or protector, D. H. Rockwell 462,164
Corset fastening, C. H. Littleton 462,054
Cotton chopper, L. M. Poole 461,931
Coupling. See Car coupling. Train coupling.
Crane, Potter & Burns 461,874
Cross tie, metallic, J. M. Price 462,062
Crusher. See Ore crusher.
Cultivator or harrow tooth, F. X. Krabach 461,887
Cup. See Umbrella drip cup.
Curtain, flexible, R. B. Fowler 462,084
Cutlery, table, J. Sheppman 462,066
Cutter. See Cigar cutter. Gear cutter. Rotary cutter. Toast cutter. Turf cutter.
Dental mallet, H. C. Hinchman 462,133
Derrick fork attachment, J. S. Scott 461,987
Digger, W. Gibbs 462,043
Display case, F. Herfort 462,130
Displaying stand for boxes, etc., W. P. Miller 462,084
Diving dress, W. Carey 462,302
Door, flexible, H. N. H. Lugrin 461,880
Door or window screen frame, G. S. Briggs 462,197
Draught apparatus, artificial, W. C. Munroe 462,734
Drain pipe, G. Richardson 461,891
Drill. See Coal drill.
Drill press, column, U. & F. L. Eberhardt 461,951
Eggs, device for opening hot boiled, F. N. Jewett 462,049
Electric connection, J. H. Fleming 461,898
Electric generator, C. G. Young 461,982
Electric heater, J. V. Capek 461,814
Electric machine or motor, dynamo, M. Mayer 461,979
Electric machines, automatic regulator for dynamo, W. L. Silvey 462,090
Electrode, secondary battery, Ents & Phillips 461,833
Elevator shafts, device for operating doors to, L. W. Butler 462,300
Embroidering machine, J. J. Klaus 462,051
Engine. See Hot air motor engine. Pumping engine. Steam engine.
Envelope machine, J. Dennis *et al* 462,210
Envelope machine, drier for, J. Dennis *et al* 462,308
Envelope machines, gumming mechanism for, J. Dennis *et al* 462,309
Evaporator. See Fruit evaporator.
Exhibiting rack, merchandise, W. High 462,082
Exhibitor, W. R. Garner 461,869
Fabric winding and stretching apparatus, H. Worce 461,964
Fare receiver and register, L. Erhlich 462,114
Feed trough, W. A. Leech 462,146
Felt boot, R. Heaton 462,129
Fence, D. W. Fisher 461,937
Fence, G. H. Jordan 461,935
Fence making machine, wire and picket, C. N. Davis 461,818
Fence stay, J. W. Yates 461,973
Fender, A. W. Allen 462,198
Fertilizer distributer, J. J. Lawton 461,838
Fiber drawing apparatus, W. Thompson 461,955
File cutting machine, J. Buyer 462,075
Fire escape, W. B. Henning 462,081
Fire shield, G. Parker 461,983
Fires, apparatus for preventing the spread of, G. H. Fox 461,913
Flat iron and heater therefor, W. Hess, Jr 462,131
Flour packers, clutch mechanism for, H. A. Barnard 462,192
Flue Skimmer, W. J. Fryer, Jr 462,041
Fly hook, H. G. Preston 461,921
Frame. See Canopy frame. Door and window screen frame. Label holding frame.
Fruit evaporator, S. A. Latimer 462,144
Furnace. See Garbage burning furnace. Gas retort furnace.
Gauge. See Key seating or splining gauge.
Galvanic battery, C. N. Souther 461,905
Game or puzzle, W. Fickermann 462,211
Garbage burning furnace, M. L. Davis 462,076
Garment presser, C. Flower 462,039
Gas, apparatus for manufacturing, Prosser & Wilder 461,982
Gas burner, fuel, J. F. Mains 461,866
Gas, manufacture of, Prosser & Wilder 462,161
Gas purifying agents, revivifying, C. W. Jones 462,137
Gas regulator, T. Gordon 461,829
Gas retort furnace, W. H. Snow 462,021
Gate. See Automatic gate. Bridge gate. Railway crossing gate. Swinging gate.
Gate, J. T. Anglin 461,807
Gate, T. Scheibel 461,986
Gear cutter or milling machine, U. Eberhardt *et al* 461,952
Generator. See Electric generator.
Geometrical figures, device for laying off, W. B. Griffiths 462,126
Glass spheres, manufacture of solid, J. H. Leighton 462,083
Glove, catcher's, H. W. Price 461,847
Glove or mitten, baseball catcher's, J. F. Draper 461,819
Governor, steam engine, W. A. Graham 461,830
Grain meter, J. Henry 462,095
Grinding machine, roll, F. O. Fry 461,828
Guard. See Railway track foot guard. Rein guard.
Gymnascope or revolving toy, J. H. Wilson 461,946
Hair picker, O. K. Collins 462,034
Hame, W. H. Simmons 461,852
Hammer, power, A. Beaudry 461,917
Harrow, J. Pehrson 462,088, 462,089
Harvester rest driver, J. W. Cahow 461,813
Hatchway doors in case of fire, means for releasing, L. C. Tufts 461,857
Hats, device for displaying, K. K. Ferry 461,827
Hay press, E. M. Turner 462,180
Hay rack, M. Whiles 461,947
Heater. See Electric heater. Hydrocarbon oil heater. Submerged heater.
Heel blanks, machine for assorting, W. E. Cummings 461,924
Hinge, J. K. Clark 462,204
Hinge, spring, J. Wolf 461,908, 461,909
Hitching device, G. B. Coombs 461,926
Hoisting apparatus, J. Losch 462,145
Holder. See Coin holder. Label holder. Music holder. Paper bag holder. Pillow sham holder.
Hook. See Whiffletree hook.
Horse blanket fastening, M. T. Martin 461,956
Horse bleeder, C. Kammerer 461,937
Hot air motor engine, J. Gentry 462,040
Household article, A. J. McDonald 461,847
Hydrant, J. A. Gregg 462,093
Hydraulic motor, Hurd & McLane 461,938
Hydrocarbon oil heater, G. L. Swett 462,175
Indicator. See Cash indicator. Station indicator.
Indicator lock, L. Bishop 462,194
Jar cover and clamp, F. H. Palmer 462,154
Key. See Clock key.
Key seating or splineing gauge, J. Wyke 461,906
Kiln. See Brick kiln.
Kneading machine, J. M. Ruthrauff 461,892
Knife. See Orange knife.
Knife sharpener, C. F. Foster *et al* 462,091
Knitting machine, thickening thread attachment for, W. Pearson 462,155
Knob attachment, T. D. Davis 461,975
Label holders, spring clamp for, S. M. Friede 462,123
Label holding frame, M. Abbey 462,071
Ladder, folding, W. M. Penry 461,994
Lamp, J. E. Bohner 461,811
Lamp, pocket, S. N. Ayres 462,096
Lamp socket, incandescent electric, C. P. Poole 461,888
Lamps, rheostat for electric, T. A. Lacey 461,953
Lantern, switch, G. L. Estes 461,824
Lathe marking tool, Tannenbaum & Gottdiner 461,806
Lathes, tool holder for engine, E. J. Pihl 462,100
Leather splitting machine, J. A. Safford 462,105
Letter box, F. B. Downing 462,083
Letter box, street, F. B. Downing 462,092
Letter box, street, S. Strong 462,224
Lever, top joint, W. L. Pike 461,845
Life-boat, J. F. Green 461,871
Life-buoy, J. P. A. Galibert 461,956
Lifting jack, J. W. Alfred 461,860
Lightning arrester, Van Brunt & Raynor 461,991
Lock. See Indicator lock. Net lock. Sash lock.
Loom for weaving wire cloth, N. Greening 462,092
Loom take-up mechanism, G. F. Hutchins 461,978
Lumber edging machine, J. S. Miller 462,213
Mat. See Wire mat.
Matching machine, C. J. L. Meyer 462,097, 462,098
Mechanical movement, A. M. Lane 462,010
Mechanical movement, N. J. & B. S. Skaggs 461,943
Mechanical movement, S. B. Wortmann 461,966, 461,964
Meter. See Grain meter.
Milling machine, P. J. Kelly 462,050
Mine cage, self-dumping, M. S. Cuyan 461,877
Mop wringer, R. H. Mallon 462,100
Motor. See Hydraulic motor.
Motor for pumping, etc., J. E. Selkirk 461,903
Mowing machine, A. Stevens 461,954
Muff, H. F. Bindsell 462,225
Mule, self-acting, R. Schneider 462,167
Music holder, C. E. French 462,122
Musical instrument, stringed, J. A. Mackenzie 461,916
Musical instrument valve, Mankey & Eastman 462,148
Nail. See Shoe nail.
Needle threader, W. H. Lighty 462,147
Nut blank bar, J. C. Richardson 461,932
Nut lock, J. Nase 462,016
Orange knife and nut pick, combined, H. M. Hamrick 461,914
Ore concentrator, C. E. Seymour 461,893
Ore crusher, P. R. Shill 462,103
Oven, baker's, E. A. C. Petersen 462,156, 462,159
Paper bag holder, O. M. Stiehl 461,945
Paper cutting machine, C. Cranston 461,950
Pencil, F. E. Blaisdell 461,911
Photographic camera, Hare & Johnson 461,916
Photographic films, means for holding and carrying, Ellis & Lehnkering 462,116
Photographic shutter, E. B. Barker 461,910
Pianoforte, upright, A. B. Irving 461,835
Pick, A. E. Francis 461,981
Picker. See See Hair picker.
Pile fabrics, ornamentation of, *F.* Koskul 462,140
Pillow, W. W. Waterhouse 461,916
Pillow sham holder, J. F. Spofford 461,990
Pins and brooches, fastening for scarf, C. Bachem 461,902
Pipe. See Drain pipe. Socket pipe.
Pipe and boiler coverings, composition for steam, F. B. Mott 462,057
Pipe covering, steam, A. F. Hurst 462,047
Pipe joint, swinging, W. L. Shepard 462,222
Pipe machine, sewer, W. D. Sherman 462,097
Pipe wrench, E. Cook 461,894
Pistol, magazine, C. Tribuzio 461,908
Planter, corn, E. B. Wells 462,223
Plotter, J. A. F. Svenson 461,979
Plow attachment, hillside, Clapp & Westervelt 462,203
Plow pulverizing attachment, J. M. Pirtle 461,846
Pole, vehicle, T. McMaster 462,058
Polishing machine, sand, Wilson & Delano 462,185
Poultry, means for killing, G. Emerson 462,117
Press. See Hay press.
Printing press feeder, T. R. Johnston 462,136
Protector. See Wash boiler drip protector.
Pump, automatic steam vacuum, H. Snooks 462,069
Pump or other pipes, sand, C. G. Choen 461,997
Pumping engine, J. A. Groshon 462,218
Pumping engine, J. Pollock 462,061
Puzzle, H. M. Smith 462,170
Rack. See Clothes rack. Exhibiting rack. Hay rack.
Rail frog, locking device for spring, M. L. & H. W. Byers 462,201
Railway brake, friction, P. Fabian 461,825
Railway crossing gate, F. C. Crowe 462,216
Railway, electric, G. W. McNear 462,014
Railway, electric, C. W. Thomas 462,177
Railway, electric, W. B. Vansize 461,969
Railway or tramway fish joint, Stevens & Carruthers 462,071
Railway rails, fastening and support for, J. Grimme 462,080
Railway spike, D. A. Hegarty 462,045
Railway switch, electric, H. C. Spaulding 462,022
Railway track foot guard, S. B. Blizzard 462,196
Railway trolley, electric, R. M. Hunter 462,219
Railways, system of distribution for electric, S. H. Short 461,951
Railways, underground system for electric, S. D. Nesmith 462,153
Refrigerating apparatus, J. Ertz 462,118
Register. See Cash register. Ticket register.
Regulator. See Automatic regulator. Gas regulator.
Rein guard, S. N. Southrey 462,173
Rings, etc., detachable head for, C. A. Russell 461,936
Rod mill plant, T. V. Allis 461,900
Rolling mill plant, T. V. Allis 461,901
Rotary cutter, O. Pederson 462,157
Rubber tip and tape measure, combined, F. McIntyre 462,151
Saddle, harness, Thayer & Wittkopf 462,176
Sash lock, automatic, C. F. Varney 462,178
Saw gin, J. A. Bachman 462,189
Saw set, C. F. Knauer 461,836
Sawing machine, V. Beauregard 462,073
Seat. See Shifting seat. Vehicle seat.
Secondary battery, Waddell & Entz 461,858
Seeder, apple and osage, H. C. Graves 461,976
Selector and recorder, mechanical, S. L. Wiegand 461,970
Sewer trap, C. L. Gage 461,962
Sewing machine, W. L. Cheney 461,815
Shafts, mechanism for reversing, W. Fairchild 461,826
Sheller. See Corn sheller.
Shifting seat, Parry & Morrill 462,101
Shoe nail, C. C. Small 461,853
Shoe rest, E. L. Button 461,974
Show cover, L. F. Pieper 461,942
Show table and bedstead, combined extension, M. Rosenbaum 462,107
Shower bath, folding portable, O. F. Grant 462,125
Shutter, flexible, H. N. H. Lugrin 461,894
Sieve, S. G. Cooper 462,111
Signaling system, F. P. Benjamin 461,809, 461,810
Skirt elevator, C. Seel 462,221
Slicer, onion, J. F. A. Edwards 461,821
Soap, manufacturing compressed cakes of, E. G. Brown 461,973
Soap press, F. S. Rutschman 462,064
Socket pipe for drainage, etc., H. Knowles 462,052
Spark arrester, H. M. Hanson 462,127
Spark arrester, D. Johnson 462,006
Speed controlling device, H. A. Ballard 462,008
Spinning spindle support, J. R. Gray 461,982
Spool, braid, J. J. Hahn 462,004
Stamp, hand, W. W. Sawyer 462,065, 462,066
Stamp, time, J. D. Mallonee 462,212
Stanchion, Z. W. Smith 462,172
Stand. See Displaying stand.
Station indicator, J. A. Kane 462,138
Steam engine, A. J. Vandegrift 462,183
Steam generator, flash, E. Reynolds 461,966
Stirrer, cake or pudding, A. C. Bull 461,912
Stitches, forming overedge or buttonhole, J. W. Laflin 461,841
Stock, device for marking live, F. B. Conine 462,110
Stone, etc., manufacturing artificial, G. Richardson 461,888
Stool, milking, J. H. Stewart 461,944
Stove board, G. M. Richardson 461,876
Stove, cooking, C. J. Edmonds 461,953
Stove, heating, G. B. Woodard 462,186
Stove, lamp, R. A. Hickox 462,132
Stove or furnace, C. B. Gregory 462,079
Stove, vapor, L. Stockstrom 462,174
Strainer, adjustable, A. J. Devoll 462,078
Strap. See Trunk strap.
Straw stacker attachment, S. G. Scholz 461,890
Submerged heater, D. Stutsman 462,107
Sugar scum, extracting juice from, A. Hamelberg 462,095
Swinging gate, J. R. Davis 461,909
Table. See Show table.
Telephone exchanges, multiple system for, W. E. McKivitt 461,867
Thill coupling, C. Bassford 461,906
Thrashing machine, J. Branning 461,904
Thrashing machine, G. H. Theede 461,907
Thrashing machine feeding attachment, C. & P. Quintus 461,875
Ticket register, E. F. Antrobus 462,072
Tie. See Cross tie.
Tile flooring, hollow, M. F. McCarthy 461,960
Time recorder, workman's, J. C. English 461,822
Tire, pneumatic, Moseley & Blundstone 462,013
Toast cutter, H. J. Lystad 462,055
Toaster, H. S. Jenne 462,048
Tools, making, E. Thomson 461,856
Tooth, artificial, J. Payne 461,844
Toy bank, J. Murray 461,750
Tramway, J. M. Price 462,063
Transplanter, T. Sullivan 461,978
Transplanting machine, J. R. Mole 461,920
Trap. See Sewer trap.
Tricycle, F. Newhouse 462,086
Trough. See Feed trough.
Truck, A. A. Coup 462,112
Truck, hand, E. D. Eaton 461,820
Trunk strap and fastening, J. R. Brown 462,198
Truss, R. Nagler 462,015
Tubing, machine for impressing ornamental designs upon metallic, J. Burkhardt 461,812
Tunnels, means for ventilating, J. A. Young 462,025
Turf cutter, W. J. Adams 461,972
Typewriting machine, W. J. Barron 461,803
Typewriting machine, B. A. Brooks 461,805
Typewriting machine, D. W. Filstead 462,038
Typewriting machine, E. S. Shinner 461,988, 462,019
Umbrella drip cup, H. A. Runkle 461,849
Umbrella or parasol, J. T. Smith 462,171
Umbrella runner, E. L. Glenn 462,044
Vacuum apparatus, Peck & Case 461,925
Valve, balanced slide, C. Eversol 462,119
Valve, balanced three-way, G. Miles 461,961
Valve, compound engine, J. H. Eickershoff 461,895
Valve for compound engines, piston, J. Marshall 462,149
Valve gear, steam engine, Van Horn & Allabach 461,902
Vapor burner, W. M. Abbott 462,069
Vapor generating device for vapor burners, H. Ruppel 461,850
Vehicle, H. Seeman 462,168
Vehicle running gear, R. L. Kirby 461,940
Vehicle seat, G. E. Hatch 461,833
Vehicle side bar, P. S. Tartt 462,070
Velocipede, J. Eisenhart 462,115
Velocipede, J. T. Robinson 462,018
Velocipede driving gear, J. H. Baker 462,191
Vending apparatus, F. J. Wood 462,094
Ventilator. See Automatic ventilator.
Ventilator or blower, E. G. Lafite 462,142
Vulcanizer, J. Fergus 462,120
Wagon, dumping, L. S. Browning 462,200
Wash boiler drip protector, Johnson & Burkhartsmeier 461,834
Washing machine, N. D. Killgore 462,139
Washing machine, G. P. Walter 461,946
Water closet, W. Bunting, Jr 462,029, 462,030
Water heater for domestic or other purposes, W. G. Flanders 461,867
Weather strip, N. Shidler 461,922
Welding or working metals electrically, C. L. Coffin 462,207
Well making machine, A. Cameron 461,903, 461,904
Well sinking machine, A. O. Hiscock 462,134
Wheel. See Car wheel.
Whiffletree hook, C. W. Blackburn 462,195
Whiffletree hook, J. L. Mussina 461,959
Wire mat, J. E. Emerson 462,217
Wire, reel for paying off, J. Coffin 462,091
Wire stretcher, W. R. Hayden 462,128
Wood, machine for embossing designs on, F. H. Hawkins 461,919
Wood, machine for ornamenting, F. H. Hawkins 461,918
Wool or other fibrous material, apparatus for drying, F. Wever 462,184
Woven pantaloons, overalls, etc., R. Fox 462,040
Wrench. See Pipe wrench.
Wringer. See Mop wringer.

TRADE MARKS.

Belting of leather and other flexible material, Jewell Belting Company 20,269
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Clay, China and similar, Lower Lansalson China Clay (Kaolin) Company 20,265
Coffee, A. Montamat 20,266
Cosmetic, liquid, E. Price 20,257
Cutlery, Graef & Schmidt 20,273
Detergent compound, liquid, L. Dirksen 20,271
Fertilizers, Carib Guano Company 20,263
Flour, wheat, Northwestern Consolidated Milling Company 20,278
Gold, silver, plated articles, flat ware and jewlery, Montgomery Bros 20,270
Gum, chewing, A. B. White 20,267
Hair tonic, W. C. Halleck 20,274
Harmonicas, mouth, M. Hohner 20,264
Paint, roofing, A. F. Hawthorn 20,255
Paper, medicated toilet, Gayetty Paper Co 20,260
Paper, writing, Whiting Paper Company 20,259, 20,260
Photographic plates and films, G. Cramer 20,254
Plaster, calcined, Western Plaster Works 20,280
Remedy for kidney and liver diseases, J. W. Bowles 20,261
Remedy for nervous disorders, Foster & Baker 20,272
Remedy for rheumatism, Crescent Rheumatic Medicine Co 20,256
Screws, bolts, nails, nuts, washers, rivets, and kindred articles, metallic, American Screw Company 20,253
Soap, toilet, D. W. Stallings 20,279
Sugar bleaching compound, D. D. Williamson 20,281
Varnishes, American Varnish Company 20,262
Watch cases, Kenosha Watch Case Company 20,266

DESIGNS.

Candlestick, S. W. Babbitt 21,136
Cane or umbrella handle, W. H. Jamouneau 21,130
Dish, covered, H. Brunt 21,128
Edging or trimming, C. G. Hill 21,129
Knob or pull, E. G. & W. Hess 21,139
Spoon, A. F. Jackson ..... 21,131 to 21,137
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